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HOW CARRIERS OPERATE

CADET QUIZ–NAVIGATION

NEWS–FICTION–PICTURES



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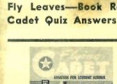
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CONTENTS

How Aircraft Carriers Operate by Keith Ayling..Page 4
Wildcats At Sea..... 10
AAFSAT—by Brigadier General Peabody..... 13
Tactics Tour by John Forney Rudy..... 18
Specialist or All 'Rounder..... 19
A B C of Navigation..... 25
Yellow Aryan by Jane Lamley..... 28
How To Fly—Aerodynamics Simplified..... 31
World's First Aerial Bombing by Howard Kegley..... 35
Which One Would You Shoot At?..... 36
Cadet Quiz by Milton Figen..... 38
Meteorology Simplified by Ernest G. Vetter..... 39
Doorways To Aviation..... 43
New Piper Trainer..... 50
Martin Marauder..... 51
In The Air—News Notices..... 54
Fly Leaves—Book Reviews..... 56
Cadet Quiz Answers..... 58



ON THE COVER

Five-man crew of a North American B-25, check details of their flight objective somewhere in ... Two Wright Cyclones of 1700 H.P. each give the B-25 a top speed of 300 m.p.h. Heavy caliber machine guns in the nose, dorsal and ventral turrets make this a formidable plane in tactical bombing operations. The B-25 has a wing span of 67 feet, 6 inches. It is 51 feet, 5 inches long.

PHOTOGRAPH CREDITS

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PRINTED IN THE UNITED STATES

World's best dive bombers, according to the British, are these Brewster Buccaneers which are joining the Navy in ever-growing squadrons.


★ HOW AIRCRAFT CARRIERS OPERATE
by KEITH AYLING
L. MEINRAD MAYER

AN aircraft carrier is a floating air base. It is not only intended to carry planes to operate against other ships, as many people rigidly believe. Its planes are also virtually marines of the air, because they can take off from the carrier, attack land bases, or land-based aircraft, and return either to the ship or land on adjacent shores.

In the beginning the aircraft carrier was intended to give air support to naval ships, and little more. This conception undoubtedly handicapped the use of the carrier, and was responsible for a great deal of prejudice and unfounded criticism.

The first aircraft carriers were built during World War I, the first being a converted battleship put into service by the British. Between wars all the powers began to build carriers, particularly America, Japan, and Great Britain. When this war started in Europe in 1939, the use of the carrier was restricted to convoy work, and fleet escort. It was generally believed that carriers were so vulnerable to attack by submarines and aircraft, that their use would prove too costly.

The average carrier is a big ship with a displacement ranging from 20,000 to 30,000 tons. She may be anything up to 950 feet long and she needs to be fast. Instead of the normal top deck studded with gun turrets fitted to the battleship she has a long flat flight deck from which the planes take off and land. At certain intervals on this deck are elevators which take the planes from the flight deck to the hangar deck where they are stored and repaired.

The "brain" of the carrier is found in the "island," a bridge-like structure which is generally aft on the starboard side of the ship (the right as you look towards the bow). In this island we find the nerves of the great ship. From here, the Captain, a flying sailor, with his assistants, the fighter-command officer, the air intelligence officer, and the gunnery officer, fight their ship. Instead of having under his command batteries of twelve and fourteen-inch guns, the captain of a carrier has from fifty to seventy-five fighter and bomber (or torpedo planes) with a far greater range than the guns. To protect his ship he has batteries of five or six-inch guns, a large number of pom-pom guns, and batteries of large and small machine guns arranged along the catwalks. Under attack by enemy surface craft, or submarines, he must take evasive action to help in his defense, and rely either on his aircraft, or escorting surface craft to beat off the enemy.



EVERY MAN ON BOARD has a job to do when the battle order goes up. Even messboys, orderlies, crewmen race to their battle stations.

He can give as hard knocks as a battleship of the line, but he cannot take them. One advantage enjoyed by the carrier over the battleship is that he can deliver his blows at a range of 150 miles at a target he cannot see.

The average carrier may carry three squadrons of planes, two fighters, one of scout bombers, and perhaps only a few torpedo planes. Sometimes the complement may be one squadron of each type, but usually there is a predominence of fighters because these machines are essential for the defense of the ship against enemy aircraft and submarines.

The Navy shipboard fighters include the sturdy Grumman "Wildcat," which has distinguished itself in the Pacific and in the Atlantic, and the new Corsair, said to be the fastest shipboard fighter in the world.

The function of the scout-bomber is to go out and look for trouble, report it, and attack by dive-bombing. These machines are two seaters. The rear-seat man is radio operator and gunner, the pilot doing the bombing. The pilot has nose-guns to defend himself against enemy aircraft, and to make straffing attacks on his target.

The torpedo planes, which may be either the TBF1 (Grumman Avengers) or the three seater Devastators, are used to launch torpedoes against capital ships, and such planes have already wreaked havoc against the big battle-wagons of the nations.

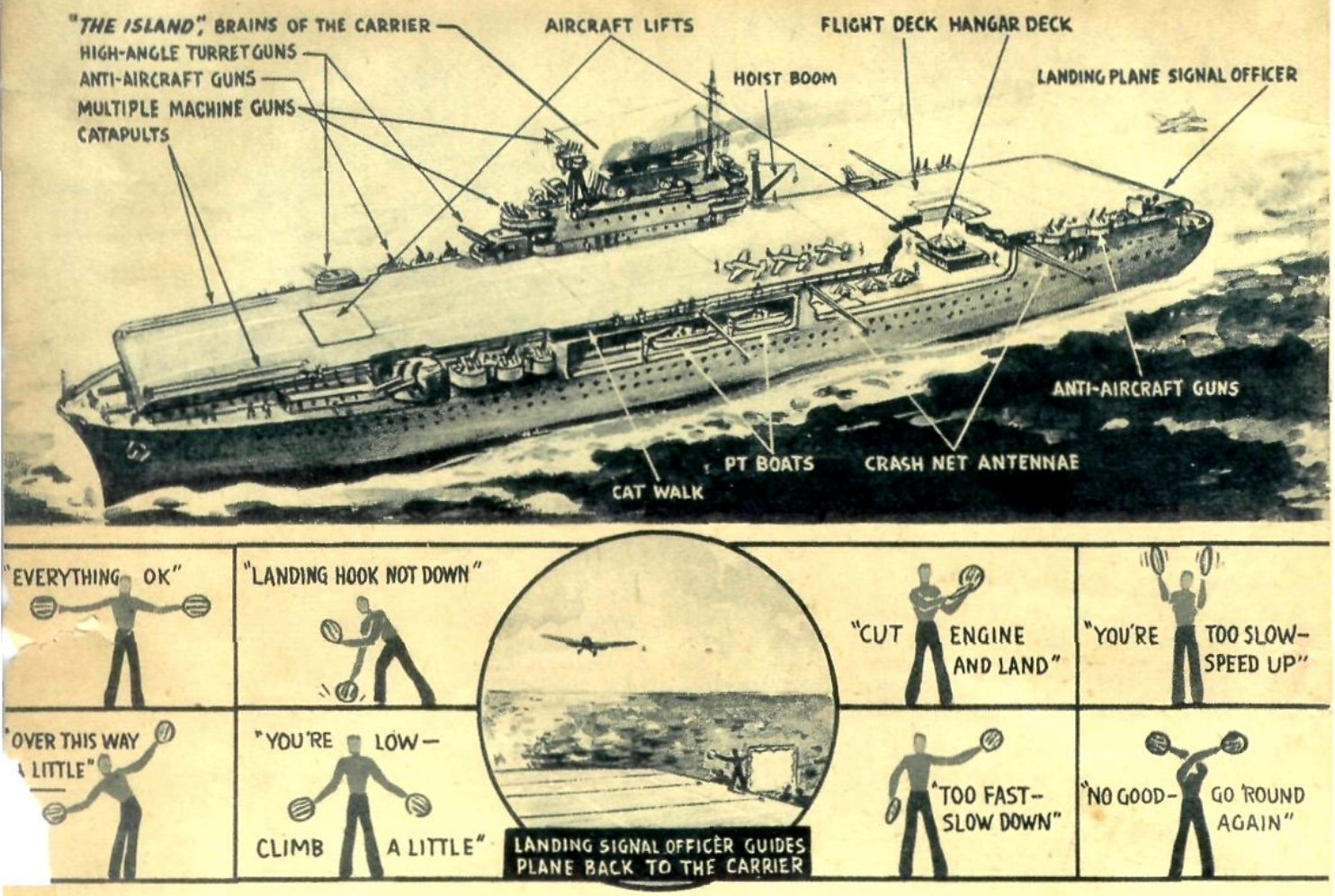
The Japanese used torpedo planes against the Repulse and the Prince of Wales, the British sank the Italian capital ship Taranto, and the German Bismarck, using torpedo planes.

They are a one-sting aircraft. They fly in on their target at high speed, fairly low over the surface of the water, release their torpedo and take evasive action. For disabling big ships to enable heavy guns to be brought to bear and for finishing off ships cripple by gunfire, the torpedo plane ha no equal. Its handicap is that cannot defend itself again enemy fighters while carrying i torpedo, although once rid of i load, its additional speed enable it to outfly all but the best fighter and at the same time put up a reasonable defensive fire.

Carriers carry whatever type of machine is best suited for the action in which the ships are likely to be engaged. Both scout-bombers and torpedo bomber need to be protected, so a carrier would never go into action without its fighters, which can also be fitted with incendiary bombs.

When the notice headed "Order of Battle" goes up on the notic board of a carrier, every man board has a job. There is n space on a carrier for passengers. Crewmen, such as messboys an orderlies, are assigned posts as machine gunners, and every man runs to his place as General Quarters is sounded over the ship's load speaker system. One of the most important positions is that of the flight-landing officer, who with his signal officer takes up his position on the flight deck in the stern or "Fan-tail." As long as the action is on, this officer is on deck, seeing the

(CONTINUED ON NEXT PAGE)



planes get off, and bringing them in. The ship must sail into wind to allow the planes to take-off and land.

On the sounding of "General Quarters," the pilots go to their ready rooms, small compartments near the island, where they wait orders that will be spoken over the ship's loud speaker system. The ready rooms look rather like small film projection studios. They have a screen for the showing of films, a notice board, and a blackboard for written instructions, and deep, comfortable arm chairs in which the pilots can relax in their bulky flying kits.

Each squadron has a ready room. While waiting, the squadron leaders explain their missions to the pilots, test them on aircraft recognition, and give them instruction. Usually the Captain of the ship and the Chaplain visit each ready-room before action to wish the pilots good-luck.

On the hangar deck the plane-captains and their crews have assembled the big machines with their wings folded back. Ship's-orders will have indicated which squadron is to "hop" first, and those planes will be already on the flight deck, each in an allotted place. The plane captain is a crewman who is responsible for the plane and everything in it until the plane takes off. He superintends the bringing of the aircraft to the flight deck, the opening of the wings, the gassing and arming, and directs the pilot to the point on the flight deck from which he roars away into the sky.

The first sign of action is when the Bridge calls, "Squadron B pilots man your planes." There is an immediate rush from the ready-room. The pilots clamber up their iron stairs to the flight deck, their gear banging and jangling. Each runs to his plane, the plane-captain helps him in, the pilot goes through his check list, and the flight-signal officer gives the signal. One by one the planes taxi to the take-off, the ship turns into wind to reduce the take-off of the planes which roar away at intervals of about thirty seconds. Some may rendezvous over the ship and continue to circle, looking out for enemy aircraft, and others assemble to group into battle formation to streak away on a distant target. If the mission is one that calls for dive bombers, or torpedo planes, they must have fighter escort. The heavier machines take off first, and the fighters follow, to takeup their escorting positions.

As the carrier is always in danger of attack by submarine, she has to keep moving. Never once does she cruise on a straight course unless she is taking on planes. Often she will take on two planes, and then change course, coming back again on her original course to pick up the others.

Landing planes in action is a rough business. The machines have to be gotten aboard as quickly as possible. Some of the pilots may have urgent reason to get aboard. Their ships may be out of gas, or they may have had a casualty. They fly round the carrier, giving an "urgent" signal, and immediately the flight-landing officer must clear the deck to take the machine aboard. A minute's delay may mean the loss of a valuable plane in the sea.

When several carriers are in action, pilots who are running

short of gas land on which ever is nearest, and often undertake their next flight with planes from the carrier on which they have landed.

On the flight deck a crew of some 150 men are waiting to receive the planes, some working the retarding gear, others to escort the planes to their stations, others handing the bombs, ammunition and gassing apparatus. Often the planes come in, and are off within a matter of minutes. The pilots remain in their cockpit giving their reports to the intelligence officers and munching coffee and sandwiches. Speed and order is essential. If a machine crashes, or damages its landing gear on the flight deck, an emergency crew takes charge and carries it bodily out of the way of the next machine that may have the same urgency to land. As the carrier is always moving and may cover hundreds of miles during the action, it is difficult for pilots to gauge the exact distance they will have to fly to and from their mission, so gas failures are frequent.

"The most lonely feeling in all flying is to be returning from a mission looking for your carrier, and not be able to find it," said a Navy flier.

All ship-board aircraft are fitted with rubber boats and escape kits in case of such emergencies, and pilots who land in the sea have a good chance of being picked by escorting destroyers, although their planes cannot be saved.

As the hitting power of the carrier depends on the number of its planes in action, every effort is made to get the planes down, although accidents will happen. In one action a carrier was just landing a TBF that had its flaps shot away when a torpedo wake was sighted, heading towards the ship. The lookout gave the warning, the man at the helm altered the ship's course a couple of degrees, the plane hit the deck at an an angle to the ship's course, bounced, and careened across the deck and into the "drink." The plane was lost, but the ship with its valuable cargo of planes was saved and lived to fight another day. "You have to be prepared for things like that," commented a Navy flier, "You can be sure if the ship acts that way, there is a good reason for it."

Deck-landing is a comparatively simple task even with fast-landing fighter planes; the forward motion of the ship always can be gauged to reduce landing speed. Immediately the plane's tail goes down, the retarding cables catch the tail wheels, the pilots apply their brakes, and the planes come to a halt in a very short space of time. Heavy dive bombers and torpedo planes can be gotten in safely even if their flaps have been damaged.

During the action the planes are connected to the carrier "operations room," where the fighter-command officer works with the Captain, by radio telephone. Until the target is sighted and attacked, however, radio silence is maintained, so that the enemy cannot anticipate the attack. Once action is engaged, the pilots report every action to the ship, where it is recorded on phonograph records. The fighter command officer may hear a squadron leader telling his men, "I am going to attack. I shall make a run on the beam of the target. You follow at 30 second intervals, take it easy. Open your flaps—good luck." As he follows the leader, each pilot will report, "A of Red Squadron attacking." Presently the squadron leader is heard, "We scored a direct hit. The target is burning. I am returning with all aircraft."

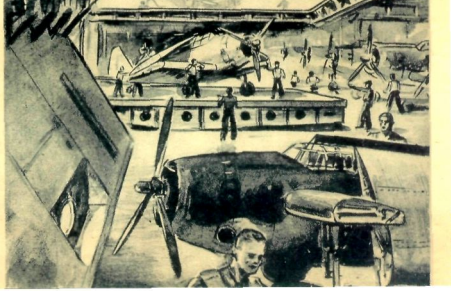
On the way back to the ship the pilots may observe the telltale feather of a submarine periscope. Immediately the report is made to the ship with the direction and course of the submarine. Often the pilot reports "I am making attack with my guns." Immediately a submarine is sighted every gun available is trained on the spot. Some of the fighter planes protecting the ship, which usually carry depth charges, fly down to attack, while others continue their patrol.

Improved defensive measures applied to carrier operation have now increased the vessels' immunity to attack. Each carrier is equipped with a special radio device that gives the position of every submarine within 100 miles which thus gives the ship's planes and escorting destroyers a good chance to destroy the under sea-raiders before they get within range.

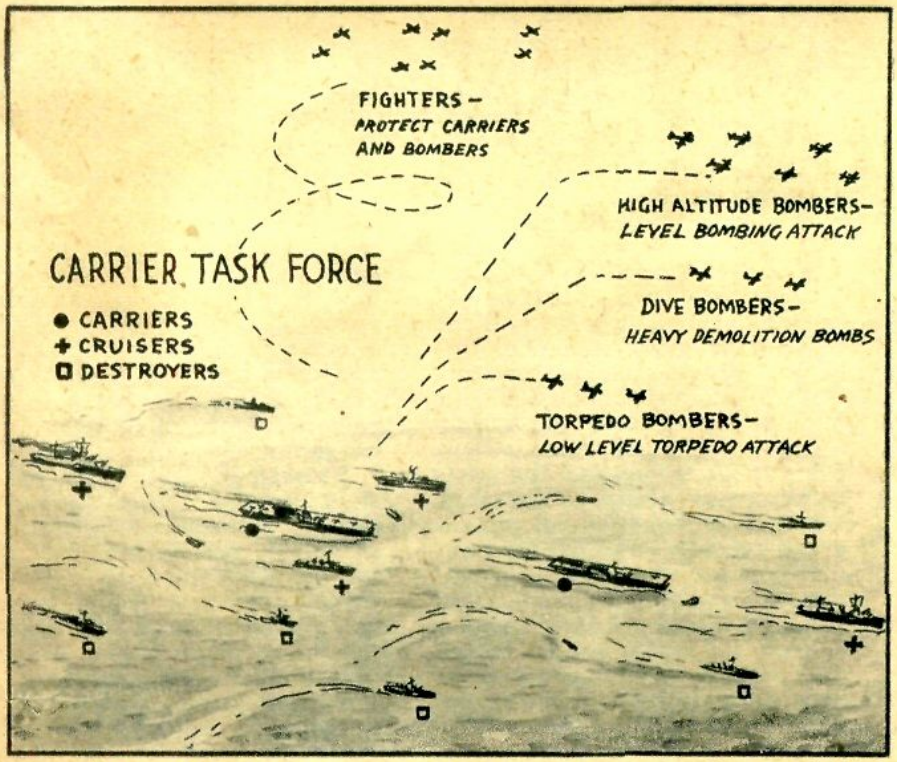
Usually in task force operations, several carriers operate together, screened by destroyers and light cruisers, and each giving the other the protection of its planes. One squadron of fighters can protect three or four carriers, while the other planes are employed on offensive missions.

Against attack from the air by torpedo the carrier is as vulnerable as the battleship, because the torpedo plane scudding at high speed across the surface of the water, usually coming out of the sun, or with the darkening evening sky behind it, offers a difficult target either for anti-aircraft fire. Attacked by one torpedo plane, the vessel has a good chance of evading the torpedo, but if several attacks are made simultaneously from various angles, the proposition of defense is a difficult one. The newest carriers have great increased armament

(CONTINUED ON NEXT PAGE)



THE HANGAR DECK on a modern aircraft carrier



TWO-CARRIER TASK FORCE, in battle formation, attacking with high altitude, torpedo and dive bombers and maintaining an escort of fighters

in the form of light anti-aircraft guns with a longer effective range than formerly, and the crew marksmen have a better chance of hitting the attacker before the torpedo is launched.

For its defensive maneuvers the carrier depends mainly on the human eye. Lookouts with telephonic communication to the bridge are posted at frequent intervals along the catwalks, at the bow and the stern and on the island. On their eyes depends the safety of the ship. Immediately a man sights a submarine or a torpedo wake, he informs the bridge, and the ship alters course, often just in the nick of time. Simultaneously the gunners go into action.

There are two main types of carriers in use today, the large ship capable of carrying fifty to seventy-five planes, and the converted carrier, or smaller vessels that the Navy calls "oil slicks." These small fellows have less chance of being hit than the big ships, but their plane capacity and range are limited.

The big carriers are practically self-contained air stations. Below decks they have repair shops where crewmen can undertake practically any repair that could be done on land. Spare parts and spare planes are carried, there are workshops with lathes and in some cases welding equipment.

The smaller ones are "carriers" in the strict sense of the word, with an even barer accommodation for pilots and squadron personnel than on the big carriers, where the "visiting" squadrons find little comfort, every accommodation being stretched to the limit.

One of the most important uses of the carrier is that it can be employed to transport air power quickly to any desired theater of war. The U. S. Navy demonstrated the utility of such ships when the USS Wasp was loaded with Spitfires and dispatched to Malta, where the planes took off, joined in the air battle in progress and then landed on the island, while the carrier retired to safer waters.

During the North African campaign, the U. S. carriers brought Navy fighter planes and scout-bombers from the American Atlantic coast, and successfully subdued the Vichy air resistance while the troops landed under the cover of the guns of the U. S. and British fleets. With the expedition were also carriers carrying land-based aircraft, which took off from the carrier decks and landed on the airfields captured by the advancing troops.

This action will go down to history as the first in which the carrier has been successfully used in amphibious action. The U. S. Navy fliers fought for three days, over a coast on which they never landed. Immediately their missions were completed the carriers sailed back to the U. S. A. and the military fliers took over.

Such use of carriers may have jolted some of the die-hards on both sides of the Atlantic, but it proved that such floating air bases are essential if we are to bring our full air power to play on any section of a coastline out of normal fighter range.

Carriers are likely to play a leading part in the subsequent invasions of Europe, and Japan. A fleet of light carriers could bring so many fighter planes or dive bombers to an enemy shore, and could deliver such rapid and devastating blows that unless the enemy were warned of the attack long enough to concentrate his air power, control of the air could be gained long enough for troops to land. If you will look at the map of Europe, you will see just where carrier operation would be of greatest use.

To operate a carrier in the narrow waters on the British Channel would be unwise and unnecessary because the British coast is itself an efficient air base for the dispatch of bombers and fighters. If an attack were to be made on the Norwegian coast, a fleet of carrier based planes would be essential. If the Atlantic coast of France were to be the target of one invasion spearhead, say the German-held base of Lorient, the only feasible method of air attack would be from carriers based some 100 to 150 miles off the shore. The ships would appear at dawn, dispatch their bombers and fighters, collect them at night and steam out to sea. Only by a concentration of German bombers, fighters, and sea-power could such an armada be beaten off.

For attack on Japan we need carriers and more carriers. We need fast carriers, and destroyers to act as their escorts. Only by the use of such craft can our air striking force be brought within reach of the enemy.

There are many people who believe that we must think of carriers in the same terms as we think of bombers. We must make mass carrier attacks. The urgent need is for carriers and more carriers. A naval expert who has seen a considerable amount of carrier action in the Mediterranean has stated that while one carrier is vulnerable because its striking force is limited, three carriers are six times less vulnerable because their combined striking force can eliminate enemy attack bases, and they can be protected with the same num-



FIRST AMPHIBIOUS ATTACK by carrier planes resulted in debacle for the Japanese at Wake. First attack of the kind to succeed was in the invasion of North Africa when carrier planes subdued air resistance.

ber of planes as it takes to undertake combat patrol over one. He outlined the future role of the carrier as long ago as 1941. Subsequent events have justified his opinion. He was thinking then of 100 carrier attacks on enemy coasts, and fleets, believing that a mass attack has a greater chance of success than a series of light punches.

Those critics of the carrier might well study the record of the Lexington, one of Uncle Sam's most famous flat-tops that went down fighting in the Pacific.

In her battles, the Lexington's planes accounted for 23 enemy ships sunk or damaged, disposing of some 10,000 enemy personnel. Her fighters shot down ninety-one Japanese planes in the Coral Sea action alone. Her death blow was given not by the enemy but by an internal explosion, which forced the Captain to give the orders to abandon ship and to finish her off with a U. S. torpedo. Ninety-five per cent of the crew have survived. This seventeen-year-old carrier had already survived two direct hits by torpedoes and two by bombs, and several near misses. Had she been a modern ship, she might still be afloat today. Into the new carriers being built today goes the best in naval construction, aimed to make them invulnerable.

WILDCATS AT SEA

Grumman F-4-F Fighters are called Wildcats. Here is a group with their wings folded for saving space.

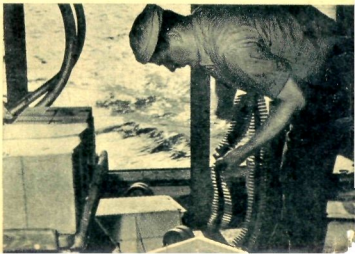
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SPECIAL OCCASIONS call for turkey dinners.



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AMMUNITION IS INSPECTED as cases are opened.

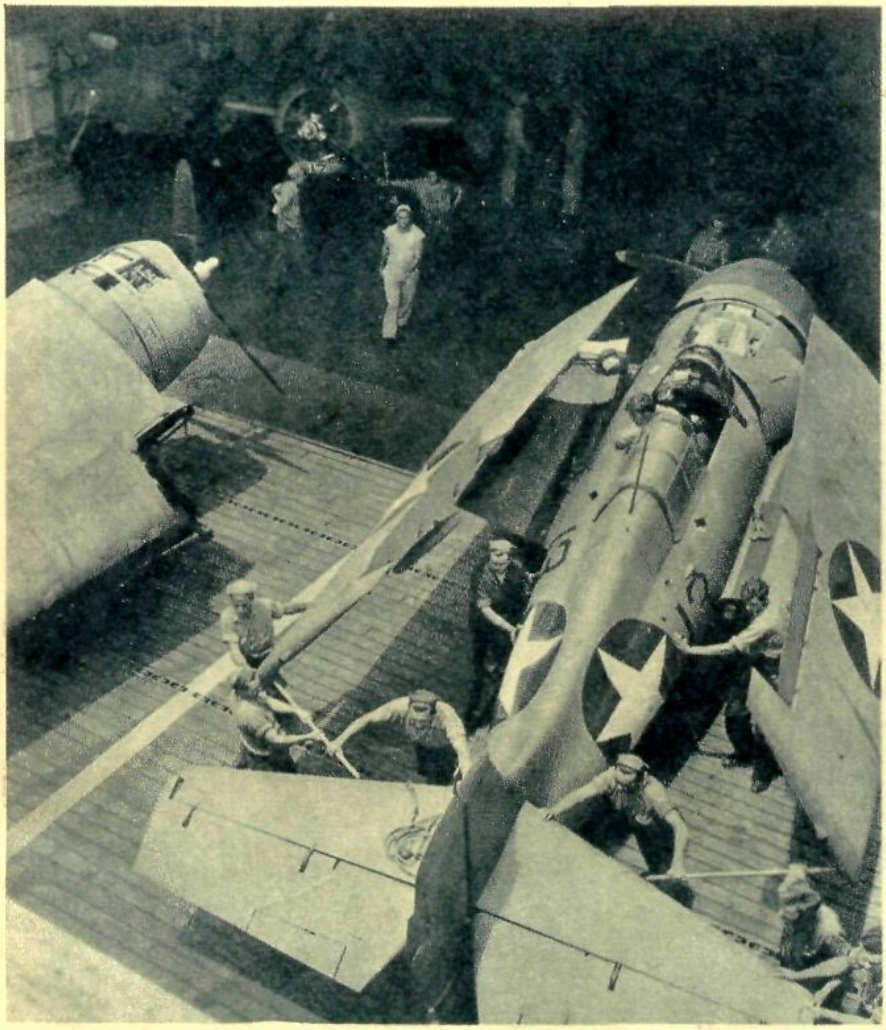




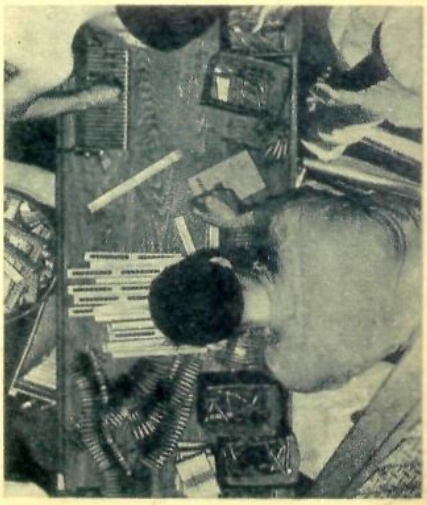
CARRIER PILOTS get their training on ships like this one which, from this altitude, looks mighty small for the landing of a plane as fast as the F-4-F Wildcat.



TYPICAL FIGHTER PILOT is Robert Hale Stonum, Ensign, photographed between flights. Pistol and knife are carried in case of an emergency landing.



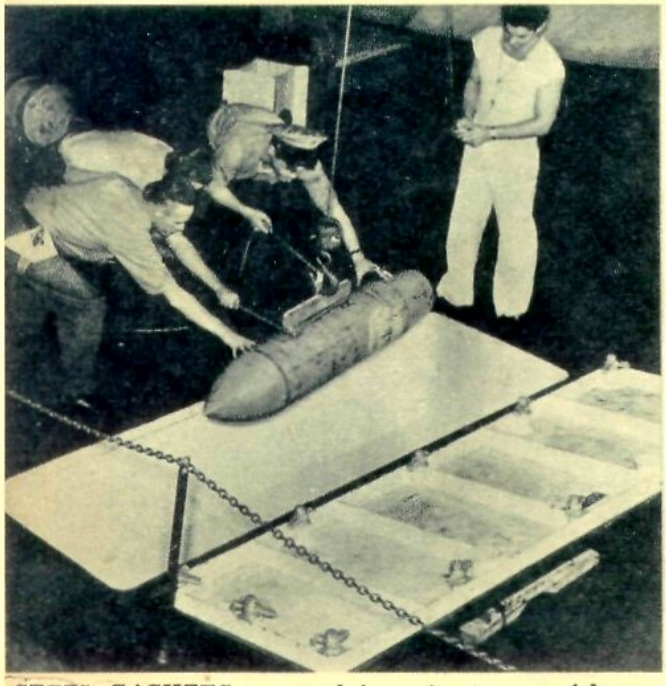
HANGAR DECK is connected to flight deck by means of one or more enormous elevators. Spare planes are stowed and serviced on hangar deck. In picture above, F-4-F Wildcats are being moved to the elevator.



MACHINE GUN CLIPS are filled by members of the armorer crew at sea, as part of their daily routine.



FOR EMERGENCY SURGERY, aircraft carriers have a complete operating room and medical staff.



STEEL CASKETS are used for safe storage of heavy bombs on aircraft carriers. This is a 500-pounder, which is being lifted very gingerly with a hoist.



WILDCAT MACHINE GUN, 50-calibre bullets are armor-piercing. In addition, the Wildcat can carry two 100-pound bombs for dive-bombing operations.



WALLER C. MOORE is a Lieutenant from Portsmouth, Virginia and another pilot of a Navy Wildcat.



F-4-F's IN FORMATION. The Wildcats are powered by a 1200 h.p. Pratt and Whitney air-cooled engine, have a top speed well over 300 m.p.h, a 37,000 foot ceiling and a cruising range that is in excess of 1,000 miles.



★ AAFSAT ★

By

BRIGADIER GENERAL HUME PEABODY
Commandant School of Applied Tactics

Buzz Bombing by a group of A-20's at the Army Air Forces School of Applied Tactics, Orlando, Florida.

POST-GRADUATE SCHOOL FOR ARMY AIRMEN

BENJAMIN FRANKLIN once observed that anything can be accomplished by human endeavor if it contains only three ingredients, men, equipment and the plan.

That, in a nutshell, is the Army Air Forces School of Applied Tactics at Orlando, Florida, more commonly known as AAFSAT. In Army parlance, Benjamin Franklin's observation would mean that a complete Air Force can be built upon equipment, organization and tactics.

AAFSAT is more than a school, it is an entire theater of operations and a complete air force. It embraces not only a school at Orlando, but sprawls over a large section of Florida, just east of the Atlantic Ocean and westward into the Gulf of Mexico.

In this vast area are located many airports and landing strips, auxiliary airdromes and supply depots, swamps, rivers, lakes, rolling hills and dense jungle.

In size and character the AAFSAT theater of operations might easily be a war theater in Tunisia, or in Northern Australia, or in New Guinea, or any one of a half dozen other locations in tropical or sub-tropical areas of the world.

In this large area, thousands of men are alerted the same as they would be near the front lines of battle. The majority of subsidiary airdromes are expertly camouflaged. The men themselves work constantly in full battle dress, are completely armed and equipped to repel an invading or hostile air force.

This demonstration air force, the first of its kind ever assembled in such a manner in the nation, is not made up of a few units or groups. Its completeness is rather amazing.

Like each individual air force of the Army Air Forces, it is composed of four distinct commands:

Air defense, bombardment, air support, and air services. These four commands enable such an air force to operate as an entity.

Each of the four commands, as well as subsidiary complements, are headed by experienced combat pilots, administrators and executives who have seen plenty of active service in this war. These men are purposely brought back from such theaters as Australia and other sections of the Southwest Pacific, from the Tunisian campaign, from the Battle of Britain, and from wherever there has been actual fighting.

Many of those experienced in combat have served months or years in India against the Japs, or in Britain and Tunisia against the Germans. Some of the officers are aces with many Jap and Nazi planes to their credit.

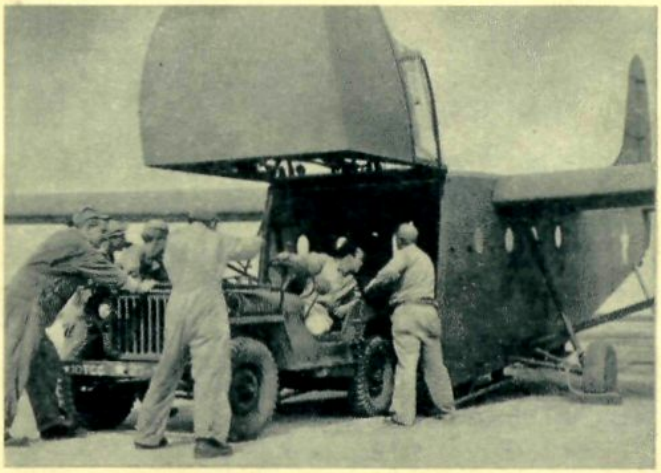
There is hardly a doubt that AAFSAT has in Florida the most concentrated group of experienced combat air force officers anywhere in the United States. They've been through the thick of it. They know what American Air Forces are up against when they fight the Nazis and Japs, what to expect from the enemy.

In addition to all of this rugged background of practical experience, these men know theory. They know what makes victory possible. Above all, they know the value and the absolute necessity of teamwork and coordination.

The purpose of AAFSAT is not merely to give selected key personnel of the air forces and other branches of the service some thumb-rule guides before they go into combat. Rather its essential function is to give the men simulated battle conditions in an actual theater of operations and, again, to train them to work in



ALMOST ALL INSTRUCTION at AAFSAT is received in outposts and camouflaged jungle areas.



LOADING A JEEP into a glider, which will shortly be hauled aloft by an Air Support transport plane.

harmony, to coordinate their activities into blows that will punch fast and hard.

The objectives of the school in training men are two fold. First, young squadron officers about to go overseas who are already indoctrinated in air education and who have the ability to pilot ships and the thousand other specialized jobs necessary in an air force, are brought to the school to obtain the latest short cuts and benefits of practical experience taught them by battle-wise veterans.

At the end of their month's training, usually two weeks of school and two weeks in the field under simulated battle conditions, they go overseas almost as well-seasoned as hardy veterans. They have learned what it means to coordinate their activities, to fight as a team instead of as individuals.

The second objective is to bring to the school the command and staff officers. These men are given administrative studies, as well as practical experience. They're also advised and trained in the latest methods of combat, the newest principles of air warfare, and are given a thorough understanding of the newest and most secret devices being used.

As the school exists now, all programs of study and experience are flexible. They can be changed as new conditions of warfare demand and require changes.

Beginning June 1, AAFSAT became an integral part of the newly-created Army-Navy Staff College, located at Georgetown University, Washington, D. C. This new college is a remarkable step forward in bringing about the integration of land, air and naval forces in combat so necessary to victory.

The new program will select command and staff officers from the army ground forces, from the air forces, from the navy and marines. Those selected will attend a month each at the Naval War College, the Command and Staff School, and AAFSAT, unless they have already attended one of the schools.

After this training the selected officers will then enroll at the Army-Navy Staff College at Georgetown for two months. This method will guarantee coordination not only within one arm of the service, but among all of them.

Classes officially opened at AAFSAT on March 2, this year. At first we had an enrollment of approximately 3,100 officers and men. These were all key personnel selected from other groups in the air corps throughout the nation, and from overseas. Soon about 4,500 men and officers will be going through the school each month, and it may go above that figure as time goes on.

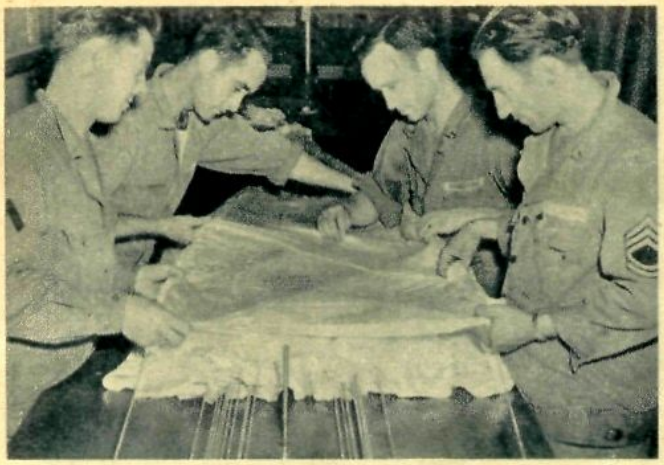
The problems given the men at AAFSAT are as complex and as tough as they'll get in any actual combat areas. Bombing missions are much the same as those carried out in the actual theaters of war; they're long and tedious, they weary pilots and tax their



FAMOUS AERIAL BATTLES are re-fought by the same men who participated in them on the war front.



LOADING GLIDERS and getting them into the air in a hurry, under simulated battle conditions.



COMBAT CONDITIONS teach airmen latest tricks of their trade before moving off to war fronts.



AIR SUPPORT COMMAND rehearses a parachute invasion while guns are firing and bombs bursting.

capabilities to the utmost. The nearness to the Atlantic Ocean and Gulf of Mexico gives them over-ocean flying experience.

Officers come back to AAFSAT from the actual battle zones constantly. They tell us: "In Tunisia we did this and we licked the pants off of them." Then they proceed to teach others how it is done, while under the fire, death and bloodshed of actual combat. Only death and bloodshed are simulated at AAFSAT.

The whole theory of the school is designed to save men and equipment, and to hasten victory.

In order to display the required teamwork, and the split-second coordination in many cases, men must be able to visualize the operation as a whole picture. This means that they must know how an entire air force ties together, what makes it tick, and what makes it function victoriously.

At the top of the entire school and its four commands, its various subsidiary airdromes, communications, supply depots, equipment and facilities is the Army Air Forces Board.

The Army Air Forces Board, headed by a small compact group of high ranking experienced officers, is the policy maker of the school. The decisions of this board affect tactical units throughout the AAFSAT theater of operations.

Perhaps one of the most vital departments of the school is the Department of Tactical Development, headed by Brigadier-General Gordon Saville. This department is charged with tremendous responsibilities, and already some of its projects have revolutionized certain combat procedure. In many instances its work has resulted in smashing air blows against the Axis.

For instance, in the Battle of the Bismarck Sea, a technique now being studied and further developed by this department, enabled American airmen to sink 22 Jap ships with 22 direct hits, and without a plane being lost!

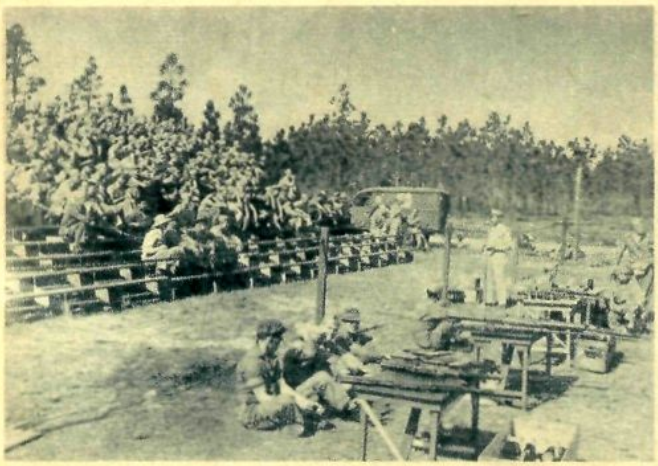
Officers from air forces other than those of the United States contribute to the development of tactics and procedure in order that men will be as perfectly trained as possible when they move overseas. For instance, one of these officers is Group Captain (equivalent to colonel) Teddy Donaldson of the Royal Air Force.

Group Captain Donaldson was shot down nine times in the Battle of Britain, has himself shot down many German planes, and spent 119 hours in the air at Dunkirk alone. One of Britain's best flying officers, he contributes his wide experience to that of others at the school.

Many of the problems worked out by the men who will eventually go overseas, are simulated combat problems from the current war, of battles that have not yet begun, or are underway at the present time.

For instance Air Support is working on a problem that concerns the Southwest Pacific. Soon a landing Army will need air

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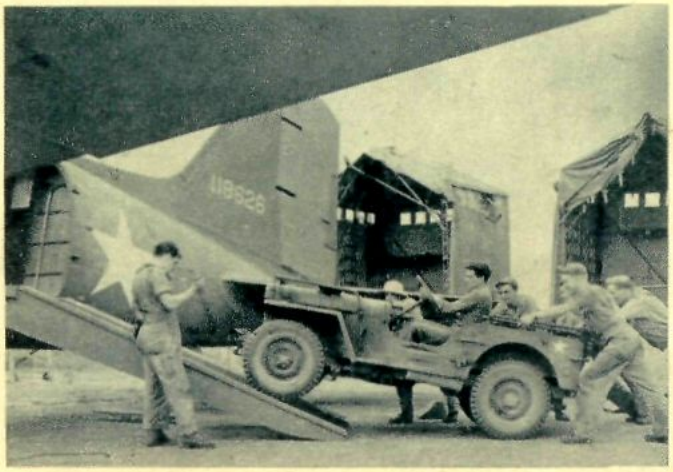
ALL AIRMEN are shown the operation and power of Air Force weapons as part of their course at AAFSAT.



INSPECTING THE MACHINE GUNS of a P-38 fighter plane immediately after they have been fired.



DISCUSSING INFORMALLY the lessons of the day. This is a typical cadre of AAFSAT students.



LOADING A JEEP into a transport ship is one of many jobs of students of the Air Support Department.

support on a certain South Pacific Island. The problem is being worked on now, being carefully and cautiously planned. These men may not take part in the actual landing and air support needed, but the problem is giving them valuable experience.

In preparing men for war there has always been the problem of trying to have them catch the significance of actual battle. Heretofore it has been difficult to do this. AAFSAT, by providing exactly the same conditions that exist in the battle areas, except actual bloodshed, soon brings men to a realization of war. It improves their morale, makes them tougher, makes them eager to get into the thick of it and get it over in a hurry. It also enables them to grasp the significance of combat conditions they'll have to face.

Men in air support are taught combat conditions by memorizing such slogans as "Have you emptied your pockets?" since the enemy often gleans important information from letters and diaries which men often keep; "Have you got your jungle kit?" a valuable thing when landing in a jungle; "Have you synchronized your watches?" also important when timing must be by split seconds; and "If captured give only your name, rank and army serial number," which doesn't give the enemy intelligence much to work on.

Under Air Support comes the big cargo planes and troop and equipment-carrying gliders. AAFSAT has both, in order to round out Air Support training.

The gliders are towed by air carrier planes, and release themselves to land on either wheels or skids. They can carry fully equipped men, or men and jeeps. Cargo planes are used to carry all kinds of equipment, including small tractors, tools and equipment for engineers to use in construction work.

An Army no longer moves on its stomach. Today it moves by fast trucks and on wings. If this is carried out successfully, the stomachs are taken care of automatically.

Air Services of Supply is set up exactly as it is in actual combat. In fact, the entire AAFSAT area is an air theater of operations. While the school is the headquarters, there are concentric rings of subsidiary airdromes and supply depots as one approaches the outer edges of the circle.

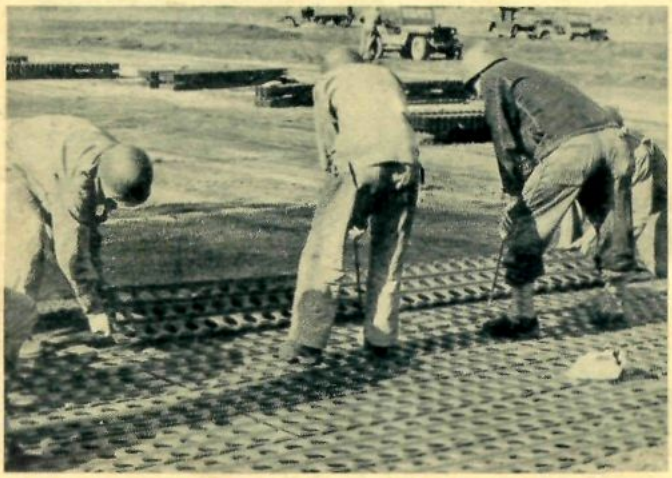
Air Service maintains a general depot, from whence comes all supplies of every nature and kind necessary to keep an Air Force operating successfully and completely.

The general depot receives aviation gas and oil, chemical warfare items such as gas, and antigas clothing and masks, ordnance, and every item required by an Air Force.

The general depot has two service centers which are about half way between the depot and the front lines. The two service centers are hidden in deep jungle and are camouflaged so perfectly that they cannot be located from



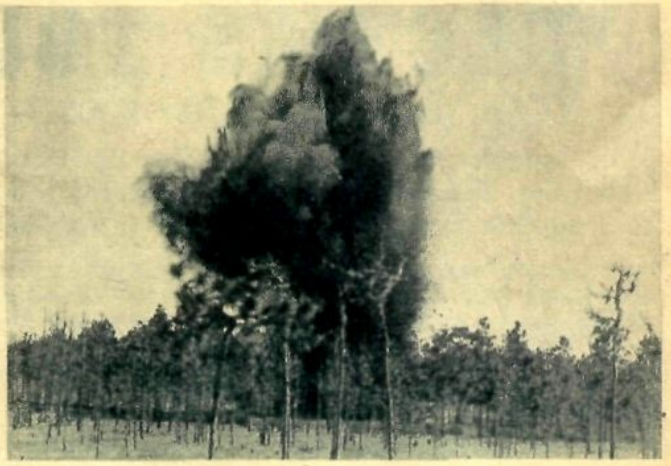
HOSPITAL EVACUATION is part of the instruction of Air Support. Here a casualty is placed in a transport.



AAFSAT ENGINEERS recently set a record of laying a 4,000-foot landing field in 35½ hours.



AIR BASE SECURITY MEN, poised in foxholes during a practice attack on an AAFSAT air base.



THIS IS WHAT a 300-pound demolition bomb looks like when it explodes about 400 yards away.

the sky. Each service center takes care of all the needs of eight combat squadrons.

This means supplying clothing, shoes, medical aid, dentistry, communications, repairs of every kind, food and any airplane part from a nut to a complete engine. The service center must be able to rebuild airplanes, telephone and radio communications, trucks or any other piece of equipment damaged. The work of a service center requires the utmost ingenuity and improvisation, and students here have already proved they are far superior to the Germans at initiative and improvisation.

Mobile gasoline ovens supply all troops in the area of a service center with bread. Refrigerated trucks deliver fresh vegetables and meat every day. Trucks haul supplies from a service center to various outposts to the tune of a half million miles in four months. And with all of this work the men must wear the same clothes they wear in combat zones, be fully armed and alerted. Foxholes are plentiful and deep dugouts are interspersed over the camouflaged area.

It's hot, it's often back breaking, and it's a tough life, but it's not much different from what the same men will soon be experiencing in the combat zones. By the time they reach such zones they're ready for war.

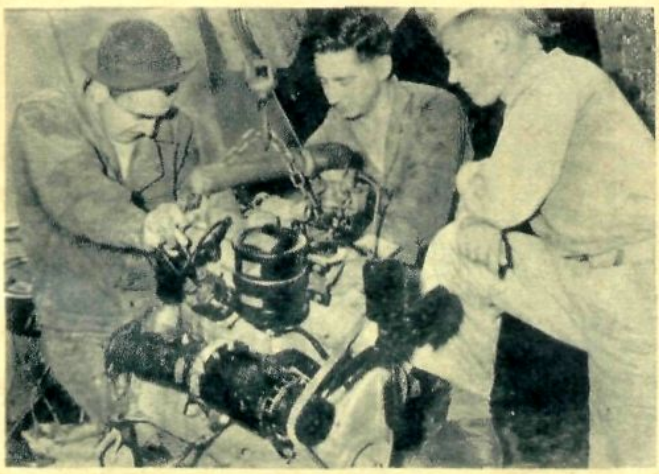
Air Services of Supply also has aviation engineer battalions attached for building airports and other engineering work. Recently one aviation engineer battalion, headed by an officer who had just returned from the Southwest Pacific where he built landing strips and airports on various islands, constructed a 4,000-foot metal strip runway in thirty-five and a half hours after the battalion had cleared the land. It is probably a world's record.

During this experiment, anti-aircraft batteries were posted near the runway. The men worked all kinds of shifts, often nine hours at a stretch, on the double, with rifles by their sides. Dive bombers and fighter planes roared over the workmen-soldiers nearly every day, subjecting them to simulated strafing and bombing. It wasn't pleasant, and it's as close as the men could be brought to actual warfare and not be shot.

The repair facilities of Air Services of Supply are enormous. Shoes must be repaired, clothing must be mended and laundered and a thousand and one other tasks performed if the Air Force is to be kept as a hard-hitting organization. At the same time Air Service must be highly mobile. An entire service center is trained to take everything apart and load it into trucks, trailers, planes and gliders, and move out of a section in a few hours.

Air Service also is charged with development and testing of new equipment such as oxygen masks for pilots, warm flying suits, repair of delicate instruments, and supplying oxygen for high altitude planes.

CONTINUED ON PAGE 52



LEESBURG SERVICE CENTER trainees give third echelon hurry-up repairs to a damaged truck motor.



IN A CAMOUFLAGED AREA of Central Florida, air corps technicians repair a damaged propeller.

★ TACTICS TOUR ★

By JOHN FORNEY RUDY

A Reporter For Flying Cadet Describes Experiences, Buzzing, Bombing and Strafing During Mock Battle Staged in Florida by The School of Applied Tactics

THEY sing a popular song in the Army Air Corps which ends up with a shout by young officers, "Nothing Can Stop The Army Air Corps!"

It was only another popular song until I spent five days, 18 hours a day, being personally escorted through the world's most unique school, the Army Air Forces School of Applied Tactics at Orlando, Florida. Today I firmly believe nothing can stop the Army Air Corps.

For months the Army has operated this school in secret right under the noses of some 52,000 persons who live in Orlando, without a single word leaking out about the tremendous developments taking place. The nation may have been worrying about what the Air Corps has been doing. Well, they're doing plenty, even if they don't talk about it.

Now it can be told, for the first time.

I started out early one Monday morning, with little idea of what high ranking Air Corps officials of the school had in store for me. They promised to show me the works. They did!

And then with the characteristic speed of the Air Corps, a new world of electronics, of amazing new planes, of camouflaged airfields and outposts, of actual bombing missions aboard giant Flying Fortresses and Attack Bombers, opened before my eyes. I didn't just see these things, I participated in them just as though I were a member of the Air Corps.

Events move swiftly in the Air Corps, often at 250 or 300 miles per hour in an Attack Bomber skimming tree tops and splitting pine needles. Sitting in the nose of an A-20 Attack Bomber, I know now what a gunner goes through, his emotions and reactions.

We roared off Orlando's giant air base, leveled out almost on top of the trees, and raced for an airfield 35 miles away. We were in perfect formation with eight other Attack Bombers. We skimmed a lake like taking cream from the top of the saucer of milk. We watched pine trees at the end of a lake suddenly come in front of us, and the pilot dexterously zooming the plane up over them and then down to hug the earth again. When Attack bomber pilots say they want to sneak in on an airport, they really mean sneak!

We neared the objective. Hardly before we realized it a dozen or more P-47 Thunderbolts thundered down from 10,000 feet like a swarm of angry bees or hornets. They dived at us, did chandels, rolls, and every other type of aerial acrobatic. You'll never be scared of the most thrilling roller coaster ride you've ever had after you watch a dozen Thunderbolts swarming out of the blue at you at more than 400 miles per hour.

On the interphones I expressed my fear to the pilot. He laughed.

"You don't have to worry about fighter planes in one of these Attack Bombers. We're too close to the ground for their dive attacks because they can't come down to us. If they do they can't pull out. And we're traveling too fast and to close to the ground for anti-aircraft to hit us. This is the sweetest thing they make."

We strafed the airport and dropped simulated bombs in skip fashion only 10 or 12 feet from the ground. And then we roared off just above the tree tops. It happens just as quick as that.

At another airfield, still inside the sprawling AAFSAT area, we landed in order that I could participate in a glider demonstration.

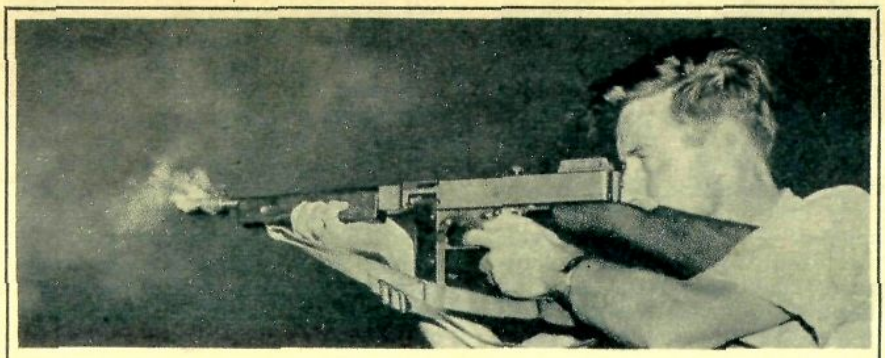
The gliders are towed by C-47 troop carrier transports utilizing a two-inch nylon rope that will stretch 15 percent of its length, then slowly return to its normal length when the stress is removed. We cut ourselves loose about 1,000 feet, and came in on the airport like a leaf falling to the ground. The glider I was aboard had 15 fully equipped troops on it.

The pace of my tour moved quickly. I boarded another troop carrier for Gainesville Airdrome about 40 miles away. In less than 20 minutes we were on the ground again. Here I watched an actual demonstration of a mock invasion.

Attack bombers roared in and strafed the ground, dropping real bombs at the edge of the field and blowing up an obstacle like knocking a bottle top off a fence. Dive bombers roared out of power dives to let go simulated bombs. Other planes came over and dropped tear gas. And then the gliders sneaked in quietly, unloaded troops which took over the softened up airport. It all happened so fast I wondered if I had actually seen it occur.

During the second day of the tour I watched a fighter group preparing an actual problem. I watched every complex detail being worked out meticulously on paper, by slide rule, by instruc-

CONTINUED ON PAGE 53



JOHN FORNEY RUDY

THE author at the end of his five day tour of AAFSAT, firing a tommy gun. The tour included actual participation in bombing missions, dogfights high in the skies, rides in gliders, amphibian jeeps and almost every other type of conveyance. He was promised at the beginning of his tour he would see all at the world's most unique air school. He did, and came away visibly impressed that the United States has the greatest and most powerful air force in the world.



SPECIALIST OR ALL-'ROUNDER

Have we too many airplane types?

YOU can divide airpower into four basic sections, attack, fighting, reconnaissance, and transport.

Translated into airplanes we have bombers, fighters, reconnaissance and troop and supply carriers. Again we divide the bombers into heavy, medium and light; the fighters into interceptors and attack aircraft; the reconnaisance into long distance photographic craft, and the fast well armed artillery co-operation machines. In the transport section we find various types of transport machines and aircraft of the air-borne command, including gliders. Germany is using six different kinds of aircraft for troop transport, including the giant Blom and Vose six motored planes, one of which was recently shot down by the British, and four types of gliders.

To obtain complete command of the air a nation must have a sufficiency of all types. If we look at the existing air forces of Britain, Germany, Japan, and Italy we see that none of them has been able to equip itself adequately.

The result of this lack of airplane types is shown by the failure of any air operations to attain complete victory.

Germany could not win the battle of Britain, because she lacked the overwhelming superiority of fighter aircraft, which would have enabled her to knock out the British fighters before they decimated her bombers. Goering used his fighter aircraft to escort his bombers. Had he had enough of them to undertake offensive sweeps over England to engage the Hurricane and Spitfires before the German bombers

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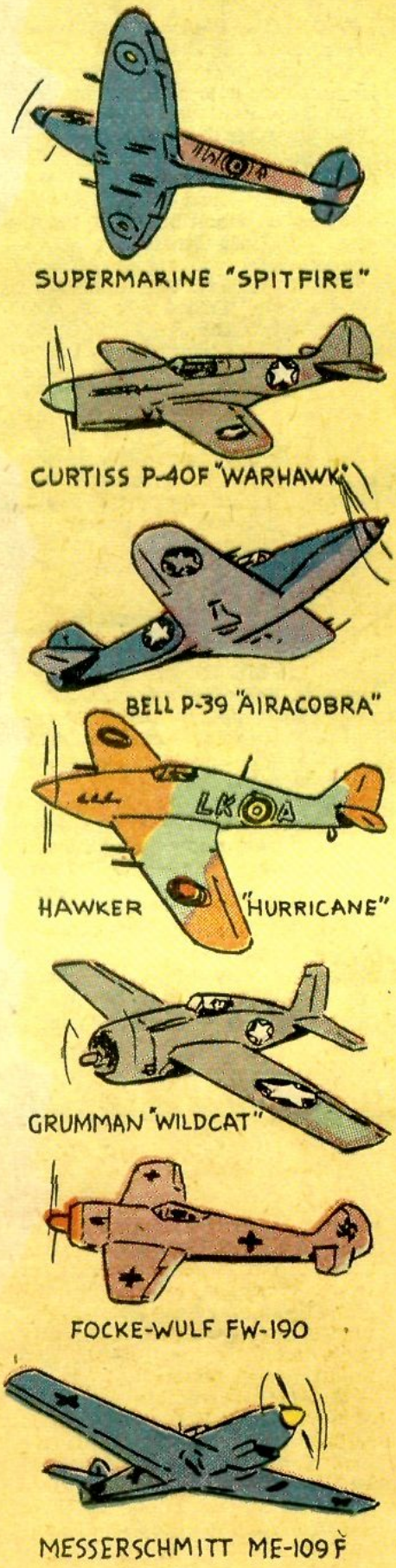
arrived, the result might have been different.

Britain lost the battle for Norway because the R.A.F. lacked fighter strength. Into action were thrown Blenheim bombers hastily fitted with additional machine guns, and old Gladiator biplanes that took off from aircraft carriers and landed on a frozen lake. The Blenheims were chosen because they have comparatively high speed and a range that enabled them to fly across the North sea, engage the German ME 109s and return. From the successful use of the Blenheims in this campaign, came the formidable long range Beaufighter.

The British failed in the Battle for Crete because of their inability to maintain fighter control of the air over the island. When the German Stuka dive bombers had destroyed the air fields on the islands, the R.A.F had to withdraw. According to R.A.F. reports the invasion of Crete was delayed several days by heavy attacks on German airfields in Greece by Blenheims and Beaufighters, both carrying bombs. Crete was not the first time fighters had carried bombs, neither was Norway the first instance of bombers acting as fighters.

To use fighters as bombers is to limit their efficiency. It is like asking a thorough-bred horse to enter the Kentucky Derby dragging a chuck-wagon. Every fighter pilot will tell you that the attachment of bombs robs his machine of maneuverability. An American Navy pilot going into action with his Wildcat, which was carrying a cluster of incendiary bombs was attacked by enemy fighters "I thought something was wrong with the machine," he related "She seemed slow, and soggy and would do nothing quick enough. Then my wing mate called me and told me I still had my bombs aboard. I dropped them pronto, and immediately the machine put up the stupendous performance we get and expect from a Wildcat."

The urgency of war always defeats the intention of the aircraft designer who builds his craft for a special purpose. He knows of course that all aircraft design is compromise, so he cleverly develops the characteristics and qualities he feels his plane must have. In a fighter he sacrifices lift for speed and climb. A heavy bomber is designed for high power and wing-loading, with speed a secondary consideration. Only in the reconnaisance and the light bomber machines do we find any approach to the perfect all-round airplane. An interesting example of versatility in the light bomber class is shown by the use the R.A.F. have made of the Douglas Boston Havoc, known to us as the A-20. The Havoc was first used as a night fighter against the German raiders over Britain. R.A.F. Bomber Command employed it for short daylight raids over France and the Low Countries. Fighter command pressed it into service as a long-range fighter. In North Africa it is being used as a low-flying attack plane equipped with bombs and machine guns, while our own U. S. Army Air Forces are using it as a dive bomber. New models are being built to carry torpedoes.



The Havoc is only one example, however, of how military needs have made a workhorse of one airplane type, because it is a good all-rounder, even though designed for a certain purpose. The practice started in the last war. The Bristol two-seater fighter became a day bomber, or low flying attack bomber, and communications machine as well as a fighter. The Bristol did everything from carrying mail, food and ammunition to doubling up as a night bomber during the German 1918 retreat, when the British night bombers could not move up fast enough to keep within range of the enemy. Other chores of this redoubtable fighter were photography, troop strafing and the transportation of high officials.

When this war broke out, designers had very set ideas on military aircraft. A fighter was to be a fighter, and a bomber a bomber There was to be no duplication. There could be no duplication, people said, because of increased speeds and armament.

Then things began to happen. After the Luftwaffe suffered so many losses from the guns of the Spitfires and Hurricanes, the Germans made a series of low flying daylight raids on England. These were executed by the twin-motored ME 110s equipped with bomb racks. The machines flew in at high speed, dropped the bombs, and usually escaped unhurt. They carried comparatively light loads, but it was a desperate effort to get a target. With a speed of 350 mph. and carrying a ton of bombs, the ME 110 was a formidable weapon. If Goering had two or three thousand of them, he might have done considerable damage. After the success of these raids an ME Jaguar with a glass nose and a crew of

three made its appearance as a day-bomber.

In the meantime the British were extemporizing. British single-engined fighters, carrying light bomb loads, began to make hit and run raids on the French coast. We began to read of Hurricanes making bombing raids, and the word "Hurrybomber" was coined by the R.A.F. Hurrybombers have done considerable damage to enemy shipping in coastal waters. Armed with four 20 mm. cannon and machine guns, the Hurrybomber can do quite a lot of damage, and several pilots have reported sinking enemy ships, using their cannon alone.

Later came the news that the Hurricanes were being used effectively as tank-strafers in the North African campaign, just as the French pilots used their Curtiss Hawks during the battle of France. They found their 20 mm. cannon were effective against the German tanks which were then not armored on the top.

One function of the Hurricane made the British critics gasp a little. An R. A. F. squadron leader broadcast that he had led eight Hurricanes on a dive bombing expedition against a factory at Calais. "We dived from 10,000 feet to under 1000, dropped our bombs and pulled out," he said. "It was quite a thrill."

Other uses of the Hurricane are high speed, high altitude photographic work. Stripped to bare necessities, and carrying specially designed cameras that can take pictures of bombed areas from extreme height, the photographic pilots streak over enemy territory to obtain the precious pictures. They have only one purpose—to get pictures. If attacked by enemy fighters they have to run for it, and as they have more speed than the normal fighter they usually make it. The Hurricane is aquatic, too. It was chosen by the R.A.F. as the ideal machine for catapulting from an armed merchantman in convoy defense. Other models have been fitted with excessively heavy armor for low flying bombing and strafing. The original Hurricane, designed in 1935, was Britain's second rank high altitude fighter, while its descendants, the Typhoon and the Tornado, fly even higher and faster. In his list of the world's best airplanes Major Nathaniel Silsbee of the U. S. Army Air Forces places the Hurricane in the classification as the best all-round fighter. With it he groups the Curtiss Warhawk (P-40). The P-40 seems to be as versatile as the Hurricane. The A.V.G. used their Tomahawks for troop strafing and bombing. At first they flew with bombs on their laps, until General Chennault got bomb racks fitted. In Africa, with the R.A.F., the Kittyhawks and Tomahawks doubled as attack bombers, troop and transport strafers and as fighters.

The only reason why these machines were pressed into service, was because the R.A.F. and the Luftwaffe lacked types for every purpose. Just as the Germans put an iron belly on the ME 109 for use in Russia and undertake ground strafing as did the Russians with the Stormovik, so the British used their fighters for any job that called for ultra rapid speed, and heavy fire power.

The Germans are still producing planes capable of doing many jobs, probably because they lack the test time to produce a new type, and the factory facilities to build it. The newest German plane, the ME 210 has many new features, one of which is the fitting of fuselage gun turrets aimed and fired by remote control. The new ME 210, however, gives the impression that the Germans are going to make it a workhorse, because it can be adapted as a medium bomber, a low flying attack bomber and a long-range fighter, which may prove to be a mistake.

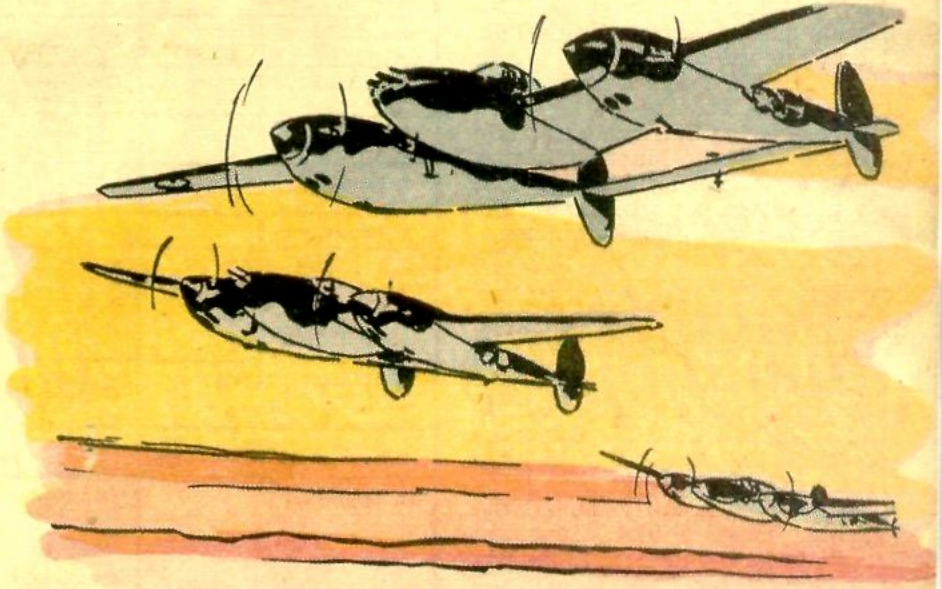
Now let us consider specialist planes as applied to the U. S. While Germany and Britain are forced to make maids of all work out of their fighters and our light bombers, the U. S. A. remains the only country capable of producing a plane for every purpose.

European nations were forced to freeze production in 1936 when Britain began producing the Lancasters and Stirlings, but America in full war production can produce and equip a plane for every purpose.

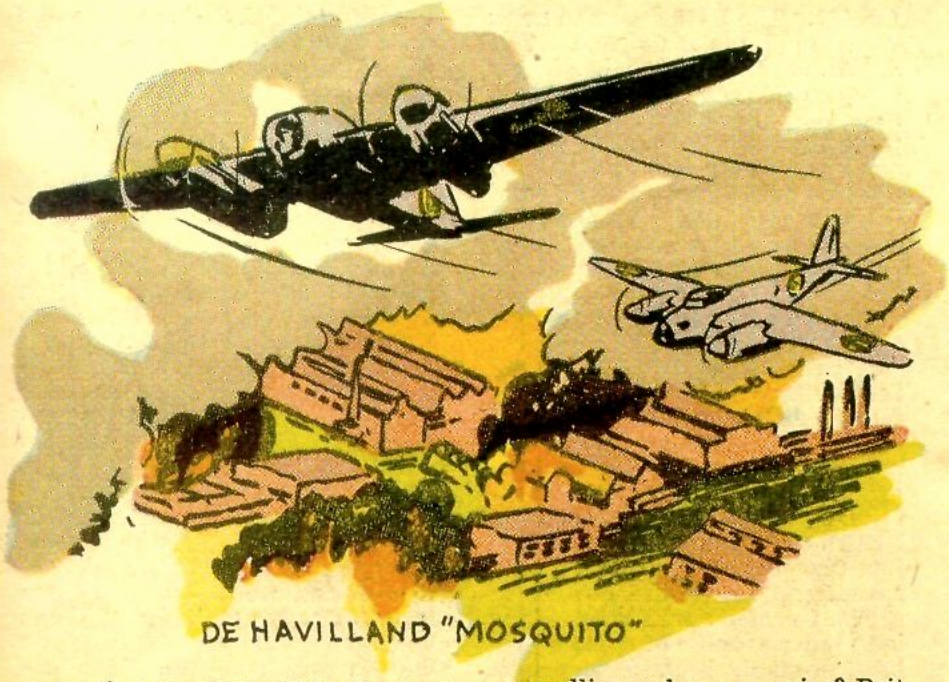
Take our fighters. For interception or defensive action against bombers we have the P38G, the latest version of the Lockheed Lightning. The P-38 is capable of high speed at great altitude. As a hit and run interceptor it probably has no equal. Its one fault is the fault of all twin-motored machines—lack of maneuverability. For this reason the British stopped production of the Whirlwind as a fighter, and use the planes of this type already manufactured as bombers. As a high-altitude fighter, we have the Thunderbolt, not yet proven in battle, but considered exceedingly formidable by the American and British experts. The P47 is our answer to the ME 109G which many consider the best high altitude fighter in Europe. For medium altitude work, and fighting patrols, we have the Curtiss Warhawk, and the new Bell Airacobra. General Arnold says that this machine, with its new motor and other modifications is so improved that it must be classed as a new machine.

In the reconnaissance class we have the new model (Mustang) with more powerful engine. Major T Hitchcock of the Air Corps

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LOCKHEED P-38 "LIGHTNING"



DE HAVILLAND "MOSQUITO"

says that the P51 will be the best fighter plane of 1943. The Mustang, as we know it, was built to British specification as a fast reconnaissance plane, with its new low-drag wing and a more powerful motor it has soared into the fighter class, and distinguished itself in action in France and North Africa.

There is a story behind the creation of the Mustang. Both the British and the Germans made a mistake in their reconnaisance aircraft. Immediately the war became mobile, the queer-looking Lysander and Henschel high wing monoplanes became obsolescent, because they were vulnerable as sitting ducks. The R.A.F. wanted a fast machine. Britain had no time nor facilities to build it, so American brains and manufacturing facilities were called in. The result was the Mustang, a reconnaissance ship that is better than many existing fighters. The main trouble with the Mustang is that it looks so like an ME 109 that its use gives ourselves and the Germans recognition problems.

So we see that we can produce fighters for every purpose, the Thunderbolt to fight and destroy enemy fighter planes at 35,000 or better, the Lightning to intercept and smash high flying bombers. For lower altitudes we have the Warhawk, and for tank destruction and low flying bomber interception, there is the Airacobra, which is aptly named the Flying Gun. The Mustang seems to be the nearest to an all-purpose fighter.

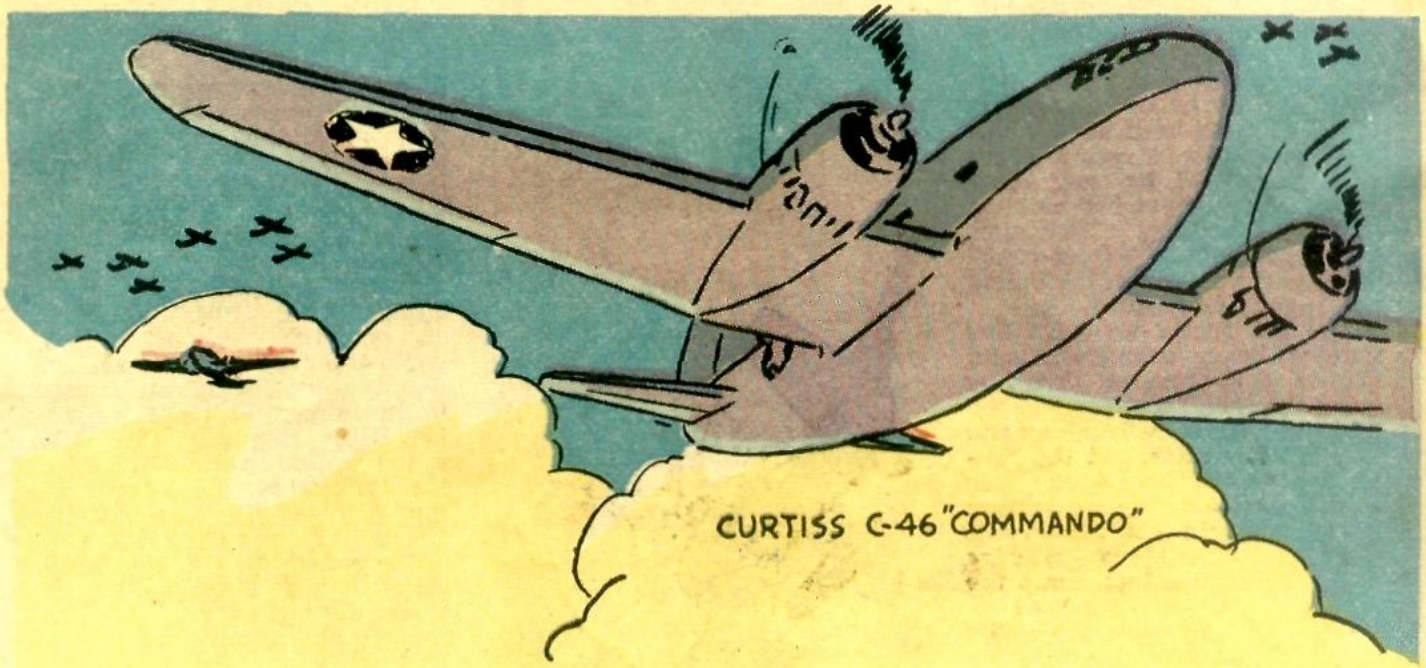
What advantage have we over our allies and our enemies? British fighters are mostly all purpose. The new Spitfire IX, with its 2,300 Rolls-Royce motor, fitted with a two-speed supercharger, is capable of interception or offensive action at altitudes from 25,000 to 40,000 feet. Matched to it are the FW 190A and the Hawker Typhoon. Unknown as yet is the Hawker Tornado, but this is likely to be in the same class as the ME 109G and the new Spitfire. Features of these British single motored fighters are high rate of climb and extreme maneuverability. The R.A.F. has always taught its pilots to fight close-up action, but insist on all fighter types being versatile. The original Hurricanes and Spitfires were capable of taking on the best German fighters as well as dealing with German bombers. The British had no time to build fighters for a one-task purpose. We have, and this is why we can produce enough of each type to win air supremacy.

How many types of planes do we need in each group, and can we specialize our production to produce more planes and fewer types so that all parts of engines can be interchangeable, and that maintenance crews of any air force of any of the United Nations can keep all types flying without specialist knowledge?

The following are the leading classifications of United Nations' planes as compared with those of the Axis.

In studying this formidable list one is tempted to ask whether some of the duplications in types might not be eliminated in the joint production program. By

Essential Class	United States	England	Axis
1. Heavy Bomber	B17-E—B24-E	Stirling Lancaster Halifax	Heinkel 177
2. Medium Bomber	B-25—26	Wellington Blenheim	Heinkel III Dornier 217-E Junkers 88 (also dive bombers)
3. Light Bomber	A-20	Mosquito Whirlwind (fighters)	ME 210-E ME-110
4. Land Dive Bomber	A-24 Vengeance		JU 87-B (Stuka)
5. Naval Dive Bomber	Dauntless Curtiss Helldiver	Skua (also a fighter)	
6. Land Based Torpedo Bomber	A20 Havoc B26	Beaufort Swordfish	SM 84 HE 111
7. Naval Torpedo Bomber	TBD-1 Avenger	Beaufort Albacore	
8. Reconnaissance	P-51	P-51	Henshel
9. Fighter—Interceptor High Altitude Medium Altitude All Round	P-38 P-47 P-39 P-40	Spitfire IX Spitfire and Typhoon Hurricane Spitfire and Hurricane	FW 190 ME 110 ME 109-G Macchi 212 ME 109-E
10. Shipboard Fighter	Wildcat Corsair	Martlet Fulmar Roc	
11. Night Fighter	A-20	Beaufighter A-20	ME-FW190
12. Transport	Commando Stratoliner (Personnel) Clipper (Flying Boat) Constellation Lodestar	(American types)	JU 90 Blohm Voss 142



concentrating in the production of the best machine in each classification, we might save a lot of maintenance and supply headaches.

In the bomber class the United Nations have a surfeit of types, including some excellent dive-bombers. Dive-bombing was invented in America, by aviators of the U. S. Marine Corps, and was developed in Germany. The Germans saw the dive bomber as a substitute for artillery rather than as an accessory to land bombardment. They designed their Junker Stuka planes solely for one purpose, to dive-bomb. They neglected to armor the planes or to give them sufficient armament to defend themselves against fighter attack. The result was that the Stuka quickly became cold meat for British fighters.

America has made no such mistake with her dive bombers. The Curtiss "Helldiver," the Douglas Devastator and the Vultee Vanguard are all well-armed, well-armored machines, and have a good turn of speed. They are specialists, but their specialty has not been developed at the expense of all-round performance. The Devastators, with their nose and turret guns, have already acquitted themselves well against enemy fighters, but always they have been able to deposit two 500 lb. or one 1000 lb. bomb on their targets.

In the ranks of the bombers we have several instances of specialists on both sides. The Fortress and Liberator are Uncle Sam's long distance weight haul-



ers, able to give and take hard knocks. The British have the Stirling, Halifax and Lancaster, all designed in 1936 and each aimed to carry a big bomb load over a short distance and back by night. These big British bombers are not capable of defending themselves by daylight and must be heavily escorted by fighters if used other than at night. When Lancasters were sent to bomb Augsburg by daylight five out of a squadron of twelve returned, whereas Fortress squadrons made eleven raids by daylight before losing the first bomber.

For daylight raids the British first relied on their Blenheims, which they also used as long range fighters, and the Wellingtons. Then they stopped using bombers for daylight raids except in very urgent occasions, such as the attack of Kiel, and began to concentrate on low-flying attack-bombing raids. For this the De Havilland Mosquito, the fastest bomber in the world, was produced. The Mosquito has many of the qualities of the Spitfire, and is as near an approach to an all-round airplane as we can hope to get. It can carry 1000 lbs. of bombs to Berlin and back, with a little gas to spare, and immediately it has dropped its bombs it becomes quite useful as a fighter if it wishes to do battle. Its most valuable feature, however, is that it can outfly Germany's fastest fighter, the FW 190 at low altitude. The Mosquito is a specialist plane.

In the heavy bomber class, the

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Fortress is undoubtedly the best all-round ship in the air, because it carries sufficient armor and armament at a speed sufficient for it to outrun enemy fighters at its critical altitude. The Fortress has a record in action unequalled by any other bomber, and as yet has no rival in the Axis camp. Its claims to be adopted as the front-ranking daylight bomber of the United Nations are unequalled.

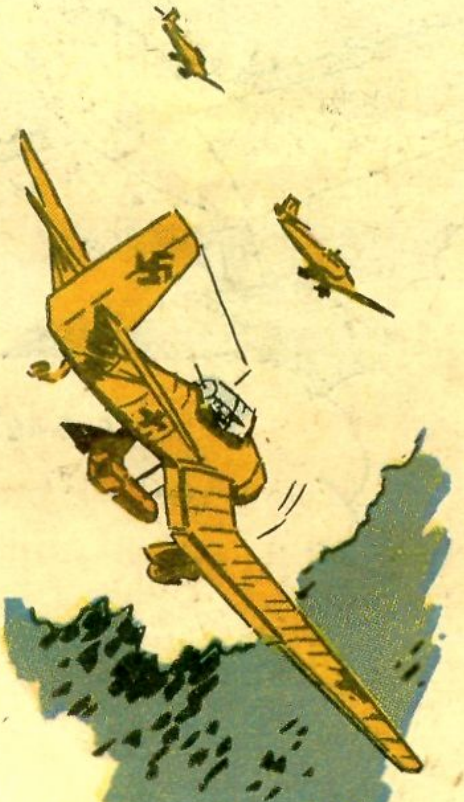
The list shows we have five types of heavy bombers. Could we do with two or three by using the New Liberator and the Lancaster for night bombing and escorted day raids, and the Fortress for long range day-time raids? In the medium bomber class we might get along well with the Mitchell, the Marauder and the Mosquito, and scrap the others.

On dive bombers there arises an important question. Do we need two distinct types for use on shore, and on carriers? Experience would seem to show to the contrary. America has the best dive bomber in the world, without a doubt, and there seems to be no reason why production should not concentrate on one type with both Army and Navy.

Just as the British are using the Seafire, a modification of the Spitfire for carrier work, so should we be able to make the Corsair available for military use, or utilize the best land-based fighters on carriers. The Grumman Wildcats flown by the Marines at Guadalcanal, although primarily designed for ship-board fighting, proved themselves equal to the best thing the Japs could send against them, although they were operating at Henderson field, and similarly P 40s have been flown from carriers. Modern ship-board landing methods have shown that the fastest fighter can be safely brought on to the deck of a warrior.

Specialization has many virtues in wartime when production speed and facility of maintenance are important. Before Pearl Harbor the R.A.F. had more than sixty different types of planes in service. This was probably a necessity because British production could not turn out enough airplanes to meet the over-powering strength of the standardized Luftwaffe.

This excessive number of types in service meant many headaches, particularly in repair and maintenance. It was necessary to find fitters and engineer specialists to undertake repairs to the American motors, and if these experts were not available, the machines had to wait until they could be brought—often thousands of miles—to diagnose the faults and superintend the repairs. At some air stations more than twelve experts, on six different types of engines, had to be kept in readiness to keep the various types in the air. Similarly, badly needed planes were grounded waiting for spare parts. This was particularly noticeable in the Middle East where sand played havoc with valves and moving parts. Each squadron engineering officer was allotted a scheduled number of spare parts which were exhausted in half the normal time because of the friction ravages of sand. A neighboring squadron might have a plentiful supply of valves for radial engines, but for another type, so the squadron could do nothing but wait. It was the same with spares for retractable undercarriages, and flap mechanism. An enemy machine-gun bullet could keep a valuable machine grounded for months, although the squadron stores might have the parts necessary for the repair if they could be adapted to suit that particular type of plane.



JUNKERS JU-87B "STUKA"

The Germans have made considerable progress in specialization by building only an essential number of plane types and motors that could be easily interchanged from machine to machine. Their Daimer, Benz, and Juno liquid-cooled motors could be taken from the ME 109, and fitted into the 110's, the Junker 88, and the transport planes, while the Junkers 700 and 1200 liquid-cooled engine can be used in the Junkers 88, and the Heinker III's. Similarly, the BMW radial is used in the FW Kurier, the Junkers 90, the Dornier 24, the Heinkel 115 seaplane, the Heinkel 177, and the FW 190.

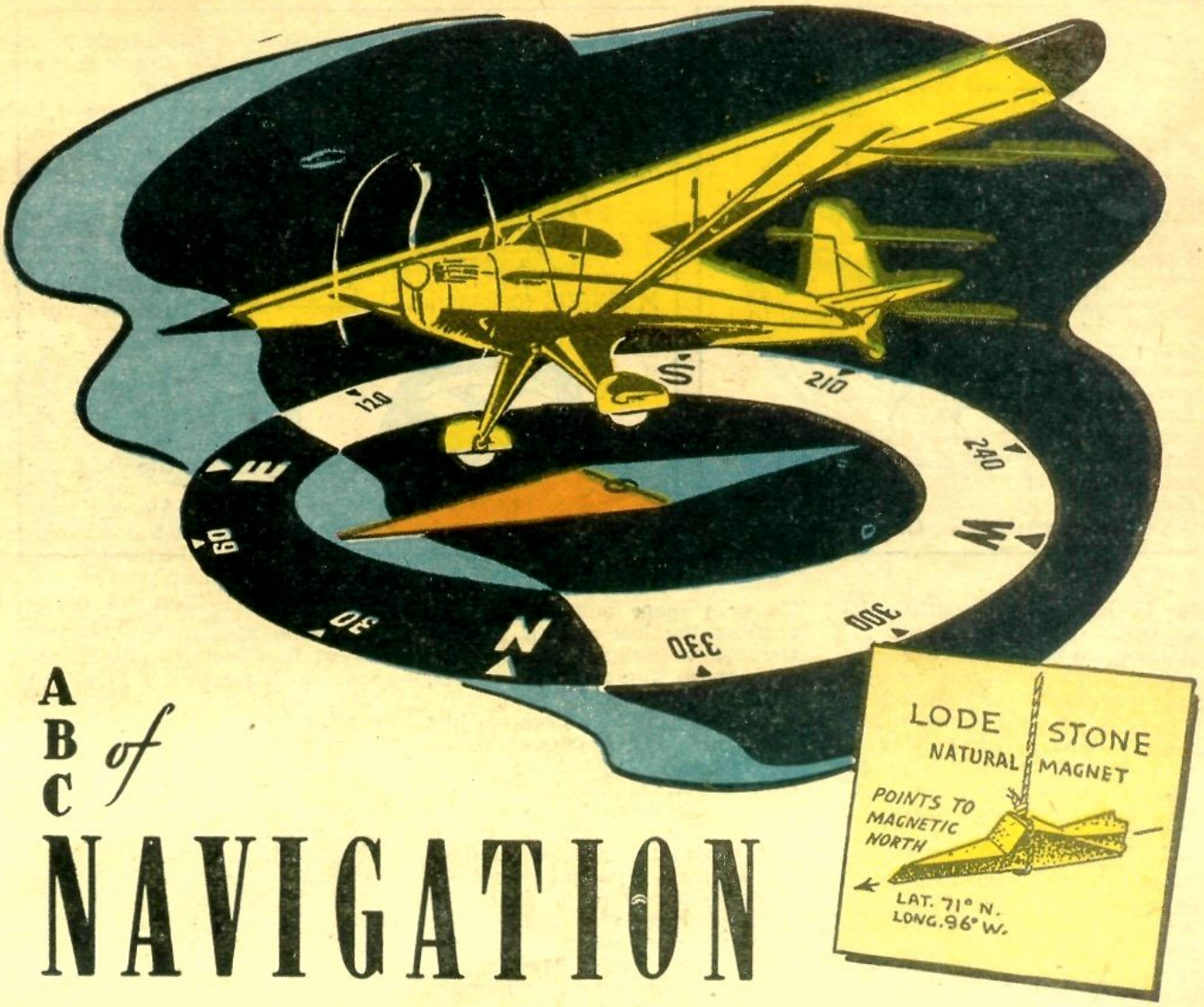
The reason for this standardization is that Germany wanted to get the highest possible value for her production lines, and to eliminate maintenance problems on the fighting front.

As will be seen from the list, the Axis has fewer plane types than the United Nations, but each type is produced in such a way that component parts of one machine can be utilized on others.

Faced with a long war, the American and British aircraft industry should aim at complete standardization. If we can effect any economics of type, so much the better. The saving of factory man-hours and maintenance hours will be enormous.

Our aim should be to produce the best plane in every group and mass-produce it. The specialist has always been the pride of the U. S. A. Enough specialist planes may shorten the war considerably.





A B C of NAVIGATION

NAVIGATION would be very simple if a pilot were always able to see the place to which he wants to fly. He would merely take off, keep headed for the airport, and eventually he would arrive. But it is not as easy as that, for, even in the best of weather, the normal distance at which towns can be recognized is only a few miles. Therefore there must be some other method of keeping a pilot headed in the right direction.

Nearly 3,000 years ago the Chinese discovered that if a piece of a certain kind of stone were suspended so that it would turn freely, it would always come to rest pointing in the same direction. This stone came to be known as the lodestone, or leading stone, because it would lead mariners in the direction it pointed. More important than this, with the establishment of one direction as a standard, other directions could be established in relation to this standard.

The lodestone is a yellow colored substance that is now known to be one of the oxides of iron. It was first found in the province of Magnesia, Asia Minor. From this the stone came to be known as magnetite or magnet. The ore was later found in other places, particularly in Spain, Sweden and the United States.

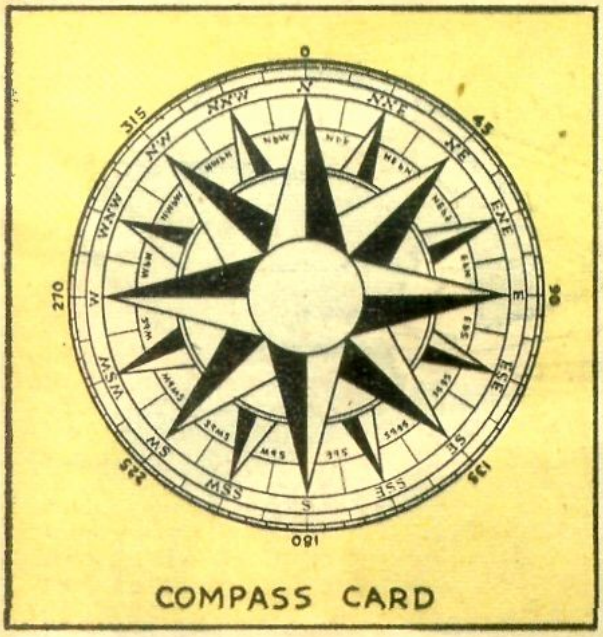
It was discovered that the properties of the lodestone could be transmitted to iron and steel. Thus a long, thin piece of steel that had come in contact with this natural magnet for a time would assume magnetic properties of its own. In effect it becomes an artificial magnet.

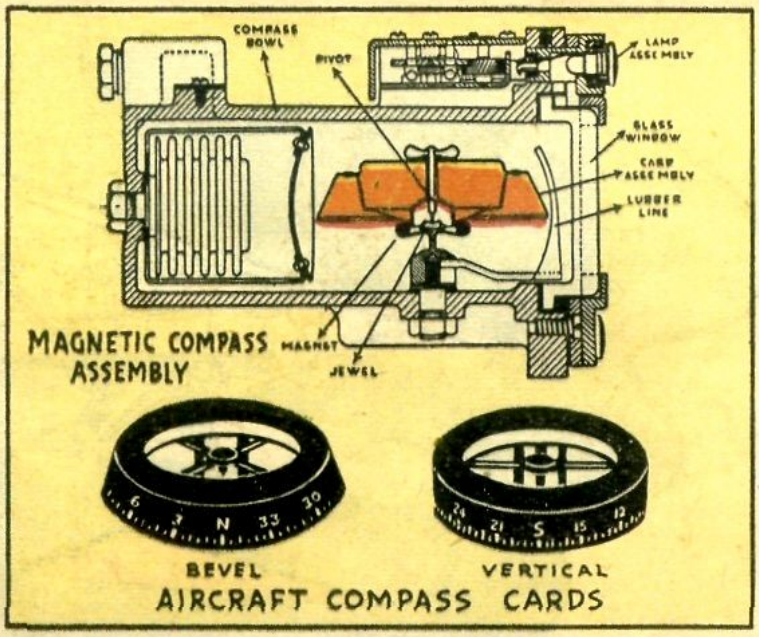
Magnets have the peculiar property of attracting and repelling one another. This force of attraction or repulsion is exhibited most conspicuously at the ends. The ends of the magnet are called poles. These poles, in order to distinguish the type of polarity, are colored red and blue.

When the red pole of one magnet is brought near the blue pole of another the two magnets are attracted and cling together. When two like colored poles of different magnets are brought together the magnets repel each other. This phenomenon is known as the law of magnetic attraction and repulsion.

Because a magnet, freely suspended, always came to rest pointing in one direction, it was logical to believe that the earth itself was a huge magnet. This has been scientifically confirmed, and because a magnet always comes to rest in a generally north-south direction the poles are designated as north and south, respectively. Thus the red pole becomes the north, or north-seeking pole of the magnet and the

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blue is the south or south-seeking pole.

Having a needle or bar that always points to magnetic north, it is a simple matter to attach to it a circular card representing other directions. This is the principle of the magnetic compass and, with it, we have the most valuable single instrument to navigation.

Great improvements were made in the early magnetic compass by Lord Kelvin in the latter part of the last century. He replaced the long heavy needle of the earlier compasses with the short compact needles in present use. The magnetic element of the compass consists of from two to twelve small flat or cylindrical needles or rods, highly magnetized. A compass card is fastened to this magnetic element and the whole assembly is secured in a case.

Most aircraft compasses are slightly different in that the card itself does not indicate the headings. In order for the instrument to be installed on the instrument panel to be easily seen by the pilot the headings are inscribed on a vertical scale attached to the circumference of the card.

In order to be seen through the little window of the case the headings are shown on the outside of the scale. When the card, scale, and pivot assembly are set in the case, the pilot sees the north heading on the south side of the scale. All other headings are reversed in the same manner so that the pilot actually sees the correct heading of the plane from the rear of the compass. The compass scale is usually graduated in 30 degree headings. To save space and for ease of reading the last zero is left off the scale readings. Thus 3 means 30 degrees, 15 means 150 degrees, 33 is 330 degrees and so on.

In case you have forgotten just how the scale happened to be divided into 360 parts we will go over that again. The Babylonians divided the figure we know as the circle into 360 parts to correspond with the number of days in the year. If you were to stand in the center of the circle whose circumference was marked off into 360 equal parts, in any direction you looked, you would see some number. The number that you would see would be the bearing, or direction, in degrees from you in relation to the zero point.

Now you can see how valuable an instrument the magnetic compass becomes with its circular scale divided into 360 degrees. When the aircraft turns, the compass card remains pointed toward magnetic north, and the figure that appears in the little window shows the bearing or the direction in which the plane is heading. A pilot merely determines, from his chart, the bearing of the place from his starting point to his destination and then, by referring to his compass he can determine in which direction to fly.

To come back to the construction of the compass for a moment there are a few more interesting points to consider. The case, or bowl, besides acting as a carrier for the scale holds the damping fluid. The magnetic element, being very delicately balanced, would swing wildly with turning motions of the plane, unless some means were taken to retard it. Therefore most compass bowls are nearly filled with some liquid such as kerosene or a mixture of alcohol and water to slow up and damp out the oscillations of the compass card. The rate at which a compass card swings back and forth before settling down on a heading is called its period. In certain types of compasses the oscillations are almost entirely damped out. This type of a compass is called an aperiodic compass, meaning literally—no period.

Exactly in the center of the observation window is a vertical line, or strip of metal representing a line, known as the lubber line. This is used as a reference mark and the point on the compass scale directly behind this line is the geographical heading of the airplane or the direction it is pointing.

The magnetic compass is subject to certain vagaries that are commonly known as compass errors. These are not all errors but peculiarities, and, until they are understood by the pilot, the compass can be a very annoying and undependable instrument. Only when its antics and limitations are taken into account by the experienced pilot does the magnetic compass become the valuable instrument that it is. These eccentricities are so important to dead reckoning and to navigation in general that they must be considered here before proceeding further.

Most important of the so-called errors of the magnetic compass is that the compass *does not point*

toward true north. It indicates, or points to magnetic north which is a point in northern Canada located at Latitude 71 degrees N and Longitude 96 degrees W. As all charts are projected with true north as a reference point it appears obvious that the magnetic compass is not in conformity with printed maps. Some adjustment must be made in order to use the magnetic compass with our aeronautical charts.

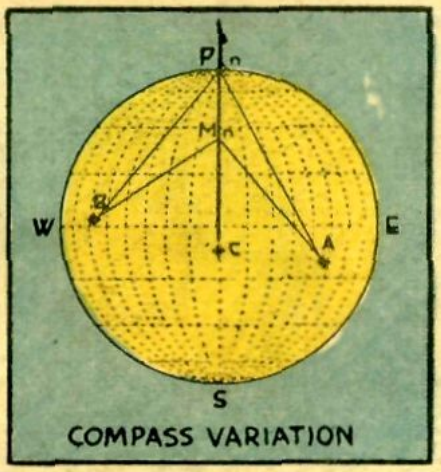
Look at the illustration to see how this variation occurs. The point labeled Pn is the north pole, or true north, upon which all charts are based. Mn is magnetic north toward which the compass points. A magnetic compass at point A would point to the west of true north and the difference would be represented in degrees by angle PAM. This difference is called compass variation, magnetic variation or just plain variation. If this angle were measured and was found to be 14 degrees we could then say that any compass at point A would have 14 degrees *West* variation.

If angle PBM were measured and found to be 17 degrees, then any compass located at point B would have 17 degrees *East* variation because it points 17 degrees to the east of true north.

At any point along the line PMC the compass would point to both true north and magnetic north. The variation along this line would be zero so this line is known as the line of zero variation or the agonic line. Any location west of this agonic line has east variation and any location east of the agonic line has west variation. This line is shown on a magnetic chart also called an isogonic chart. The line is not straight but is affected by ore deposits and other influences. On each side of the agonic line are other lines representing various degrees of variation. The magnetic variation of any locality can be easily determined by referring to the magnetic or isogonic chart.

Variation is dependent upon the location of a compass and is the same for all compasses in the same locality. In engineering and scientific work the term declination is used to indicate variation. It is a poor practice to use the word declination, however, where variation is meant because declination is a term used in celestial navigation and confusion will result.

In addition to variation each compass has an error called deviation. This is different for each compass and varies on the different headings. Deviation is caused by the magnetism of the iron in the airplane and the electrical units of the motor. When a compass is installed in an airplane the aircraft is placed on a symbol marked out on the airport called a compass rose. This is a circular pattern with radiating lines representing the various magnetic headings. The error is noted on the various 15 or 30 degree headings and little magnets, springs, etc., are installed to correct the reading on the various headings as much as possible. This process is called "swinging the compass." All of the error usually can not be taken out, however. That which can not be removed is recorded on a card called the deviation card. The deviation card is attached to the instrument panel near the compass where it can be readily seen.



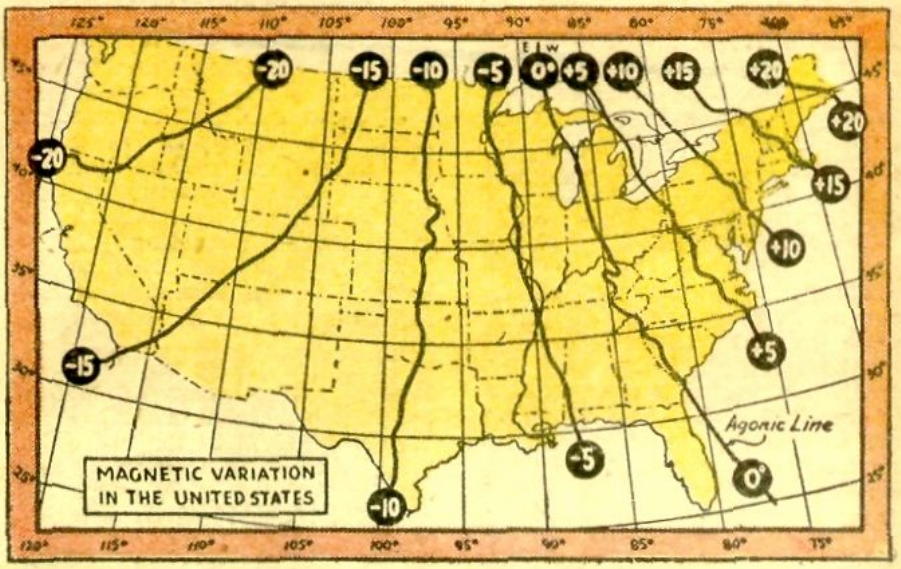
COMPASS VARIATION

Another error of the compass is that known as the "northerly turning error." Due to the fact that a compass needle points to magnetic north it would tend to point straight down over the magnetic pole. Only at the equator would the needle be horizontal. In latitudes between the north pole and the equator this tendency for the needle to dip causes the compass to read incorrectly in turns. This is particularly noticeable when turning on northerly headings but not as pronounced on southerly headings. The compass runs behind when turning on northerly headings and ahead when turning on southerly headings. After a few swings it settles down on the correct heading when the turn is completed.

Ore deposits, power plants, metal buildings also cause minor deflections in magnetic compass readings. These are called "local attraction errors," and are usually of an inconsequential nature.

Before a pilot can plan a flight intelligently he must know the wind direction and velocity. Wind acts upon an airplane exactly as the current of a stream acts upon a boat. If an airplane whose speed is 100 miles an hour flies *into* a 25-mile wind, the speed of the aircraft over the ground will be 75 miles per hour. If the same aircraft were flying downwind its speed over the ground will be 125 miles per hour. Side wind effect is just as logical and very easy to calculate by a simple procedure.

With an understanding of the principles outlined here it will be very simple to start into dead reckoning navigation, to which the next installment of this series of articles will be devoted. Keep each issue of FLYING CADET so that you will have a file of them for reference purposes.





YELLOW ARYAN

By JANE BUNKER LUMLEY

IT HAPPENED during the New Guinea campaign. There are hundreds of stories of this kind familiar to our fighting men, but not many of them come to light. But this one did. It had to because of its effects. . . .

Taro Matsui's scornful laugh wrinkled his skin like a thousand ripples on Milne Bay and his big, ugly teeth shone in his grimace. "A good soldier," he taunted, "does not stumble on the enemy's advance base without receiving a most generous reception!" His boot shot out for the third time, squarely into the young Yank's stomach.

The boy took a minute longer to straighten this time. Now was the moment ripe. Taro prodded the American with his bayonet and watched the thin trickle of blood with amusement.

"You have seen how capable is your enemy," he shrilled. "Death can be exceedingly thorough and prolonged, foolish one. But there is an escape."

The captive eased his bound body against the palm tree. Taro saw that he was struggling for attentiveness. He said carefully, "We desire to learn the position of the Great General. Tell me where we will find him and your worthless person will be spared!"

The Yank threw back his sun-bleached head until it cracked resoundingly against the tree trunk. The palm fronds whispered back. "I don't know," the boy mumbled.

Taro shrugged. "In the end, when my people have driven the evil white race back to their corner of the earth, never to spread their plague again, you will wish to return home. Your women even now wail for you. Your life in exchange for the answer I seek!"

Taro squinted at the Yank. "The Great General, where is he?

Cowering in a foxhole in Milne Bay base, in the fortress behind Kokoda, the air base at Buna?" Slyly Taro watched the gradual weakening of will in the other's face. He strained to read the expression in the Yank's eyes.

The boy stared straight at Taro, a sudden, wild birth of hope shining in his eyes.

Taro prodded:

"We shall attack them all and leave not a shred of life or equipment in their place. The lives of your brothers dangle from your weak will," he issued. "Speak!"

A look of eagerness sprang into the Yank's dark eyes. He hesitated a long moment, then on a breath came the reply:

"Buna!"

Taro's teeth gleamed again in the sunshine that pierced the pattern of leaves. "The air field! You are sure of this?"

The Yank nodded weakly. "I am sure."

"You were caught in the act of a spy in approaching the enemy base," Taro skipped through the words with great relish. "Worthless fool that you and your race are! You deserve to die! Yet you believed me!" Taro threw back his head in such merriment that four other little yellow airmen peered out of their shelter to investigate his mirth. They were in time to witness the bayonet plunged with cold accuracy through the heart of the Yank.

Taro wiped his bayonet and stared at the youth. He had doubted the boy's courage. Strange that his eyes had not faltered, had not lost their quality of hope, not even at the very end. He shrugged and turned away.

They went over the plans with infinite care. "Here is the air base," Taro pointed out on the map. "The Americans look to the north for attack. You heard the big guns shouting last night. Our position is unknown to them. See, before dawn, as they gaze toward Salamaua, we attack from the south! Remember, unless the Great White General is soon stopped, our Pacific bases will be lost one by one.

"We will drop our bombs until not one 'shoko' or 'heita' is left alive. Not a stick must be left whole after the attack. Every American plane is to be destroyed. Then we, sons of the Emperor, shall be heroes!"

They lifted their planes up out of the jungle dispersal field like a swarm of silver flies in the dark. Taro led his squadron in the familiar double-crest formation. Fierce exultation clenched his supple fingers on the controls.

It was he who had spied the American youth lurking in the jungle border; he who guessed the boy might be a scout sent out to determine the position and strength of the Imperial air force hidden deep in the jungle maze; he who had tricked the foolish youth into betraying the position of the astounding Great General. He, Taro Matsui, had organized the attack, picked out each careful plan of action, and issued the orders that not one plane or man be left after the raid on Buna.

Taro knew, with their supply of planes exhausted and their great strategist killed, that the scales of victory would then be overwhelmingly tipped against the American.

Taro was first to sight the air field. As on the reconnaissance map, the field was a smooth rectangle edged by bamboo spikes in the Dutch fashion, circled by American pillboxes, and dotted with pursuits and medium bombers. He saw it all in vague shapes and shadows made by the half-light before dawn.

Systematically the raid began. One squadron concentrated on the smooth field until all that remained were gaping crater holes; another blasted the pillboxes flanking the bamboo wall designed against parachutists; while yet another strafed the barracks at the north end; and Taro's unit exploded the grounded planes.

Out over the rim of the jungle in homeward flight, Taro dipped his craft for one last view of his achievement. The veil of night

CONTINUED ON NEXT PAGE



"Eyes were important"

gradually was lifting on a picture of devastation. The promise he had made was kept to the final desire. Not a man or plane had survived the attack. Grinning, Taro thought, the Dutch Rotterdam could have been no more successful than this. Far out over the head of the jungle he could still see the flames and smoke of the place which had been, but a few minutes before, the coveted Buna airfield.

Taro, son of the Emperor, would be remembered down through time among his people.

So sudden and perfectly executed had been the attack that not one plane had been lost or one man injured. The last to reach home base, Taro's plane was towed under the jungle camouflage. He then reported.

"Mission completed!" he saluted the shoko.

The ample little frame gave no recognition, save the flicker of his lips over toothless gums.

"Objective demolished," Taro began.

The slits parted, revealing the shoko's eyes.

"I, Taro Matsui," he boasted, "have turned the tide!"

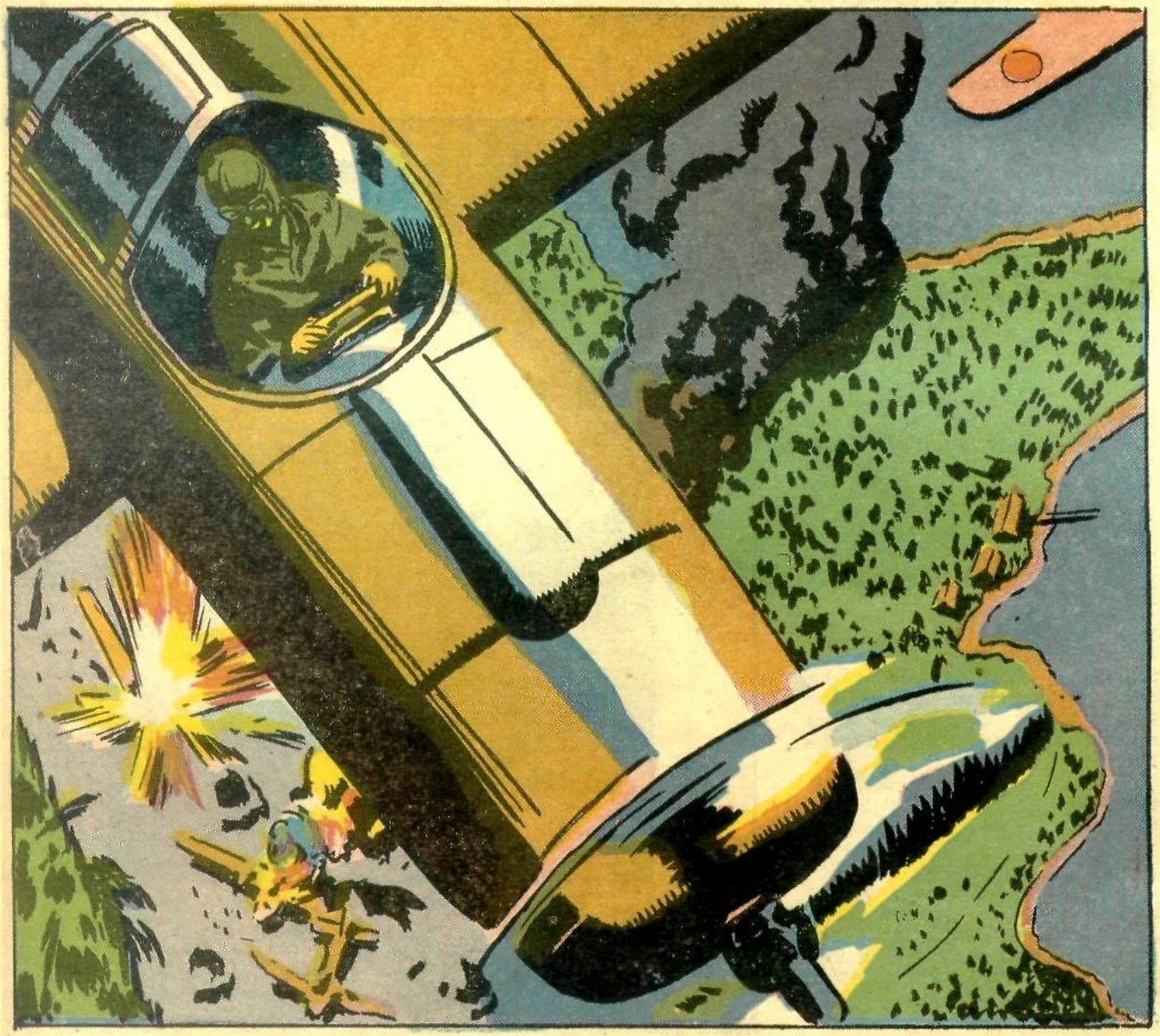
"Yes-s. So true." The voice spoke at last.

Now would his acclaim burst forth, thought Taro. Now would his glory be complete, though he could not understand the eyes.

"In the hour you were gone," the shoko suddenly began to speak, "Lieutenant Tanaka brought forth another scout, one of our own, discovered in the jungle. He had been overtaken and his message apprehended by a Yankee. He brought word from Buna."

Taro felt his heart suddenly plunge like a dive bomber out of control. Before the shoko spoke again, he knew. It was the shoko's eyes that told him. Eyes were important. He had wondered at the Yankee's eyes, before he died. He had not understood them. If he had, he would not be listening now to the shoko's words; or be fingering the sharp point of his own bayonet:

"Fool!" blazed Major Urmi. "You stupid, pig-hearted fool! The name Taro Matsui shall be a curse upon the lips of the Japanese people. Buna was taken yesterday — you have bombed your own brothers!"



"I, Taro Matsui, have turned the tide!"

HOW TO *fly*

AERODYNAMICS SIMPLIFIED

FOUR basic controls regulate the mobility of an airplane. One of them, the throttle, regulates the forward motion, as an accelerator in an automobile regulates its speed. The other three basic controls of the airplane are used to manipulate airfoils.

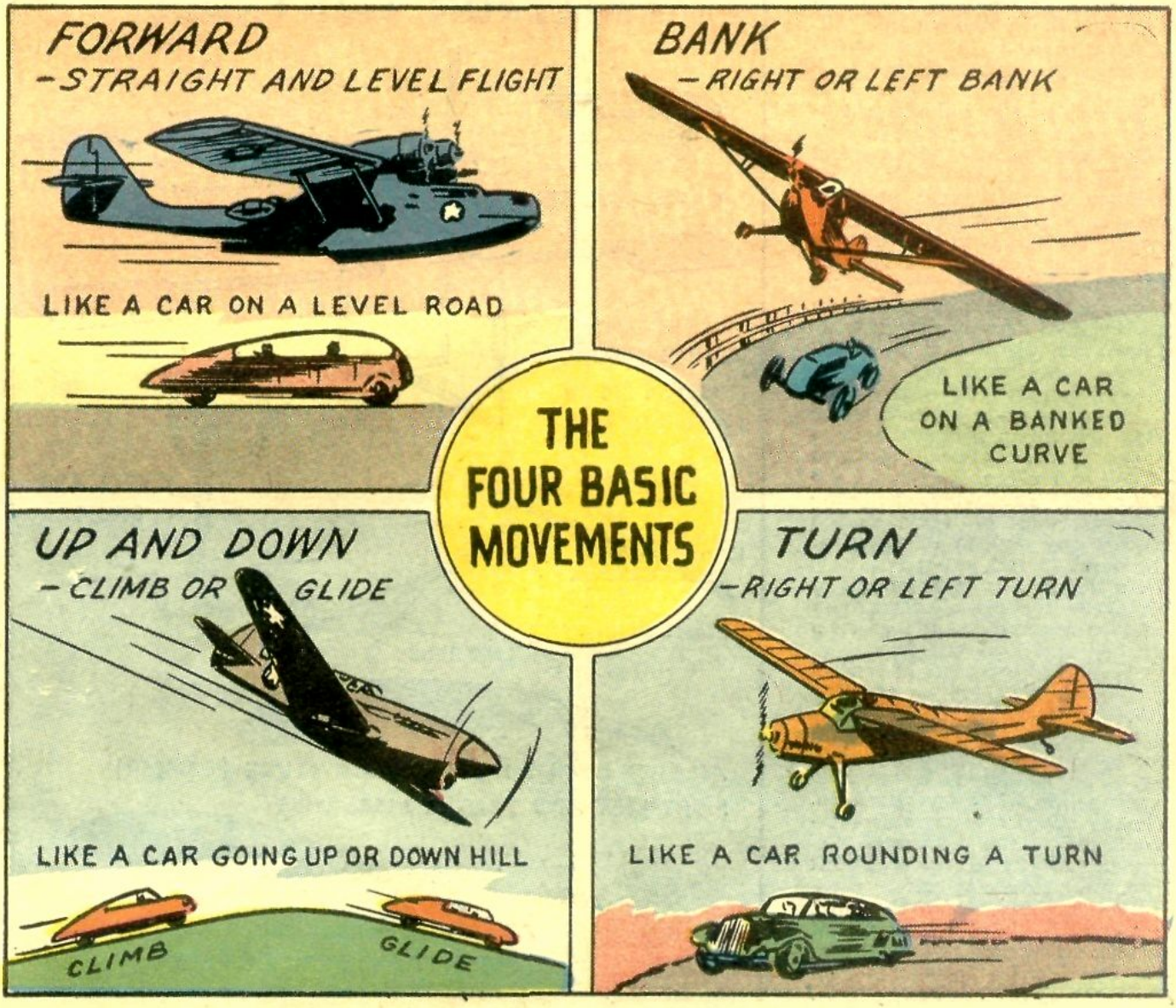
In flight, an airplane may rotate in either direction around any of its three axes.

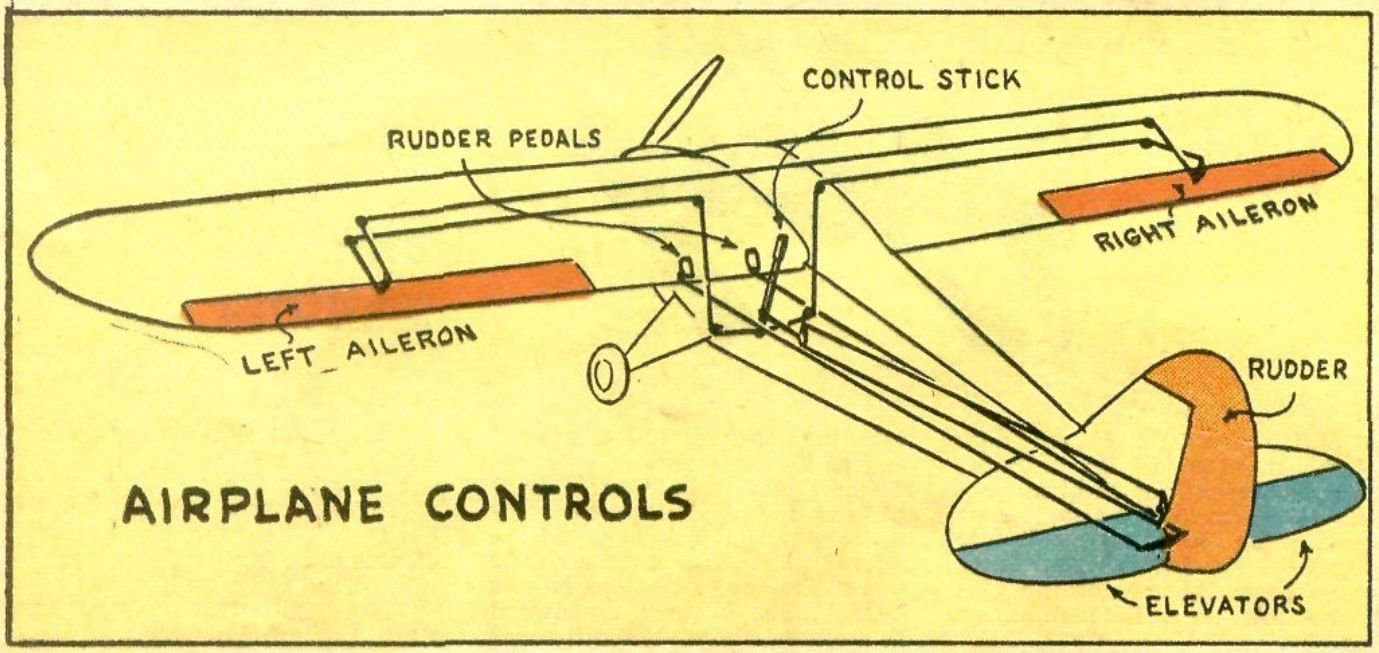
One axis runs horizontally through the airplane from wingtip to wingtip. This is called the lateral axis. When an airplane turns in one direction on its lateral axis, it turns downward in a glide or dive. When it turns the other way, it noses upward.

The second axis around which an airplane may revolve is called the vertical axis. This runs through the plane from top to bottom. When the plane turns on this axis, it changes its direction to the right or left.

The longitudinal axis is the third axis around which a plane

(CONTINUED ON NEXT PAGE)





AIRPLANE CONTROLS

may rotate. The longitudinal axis runs horizontally from the nose of the plane to its tail. When a plane is turning around its longitudinal axis, it is banking.

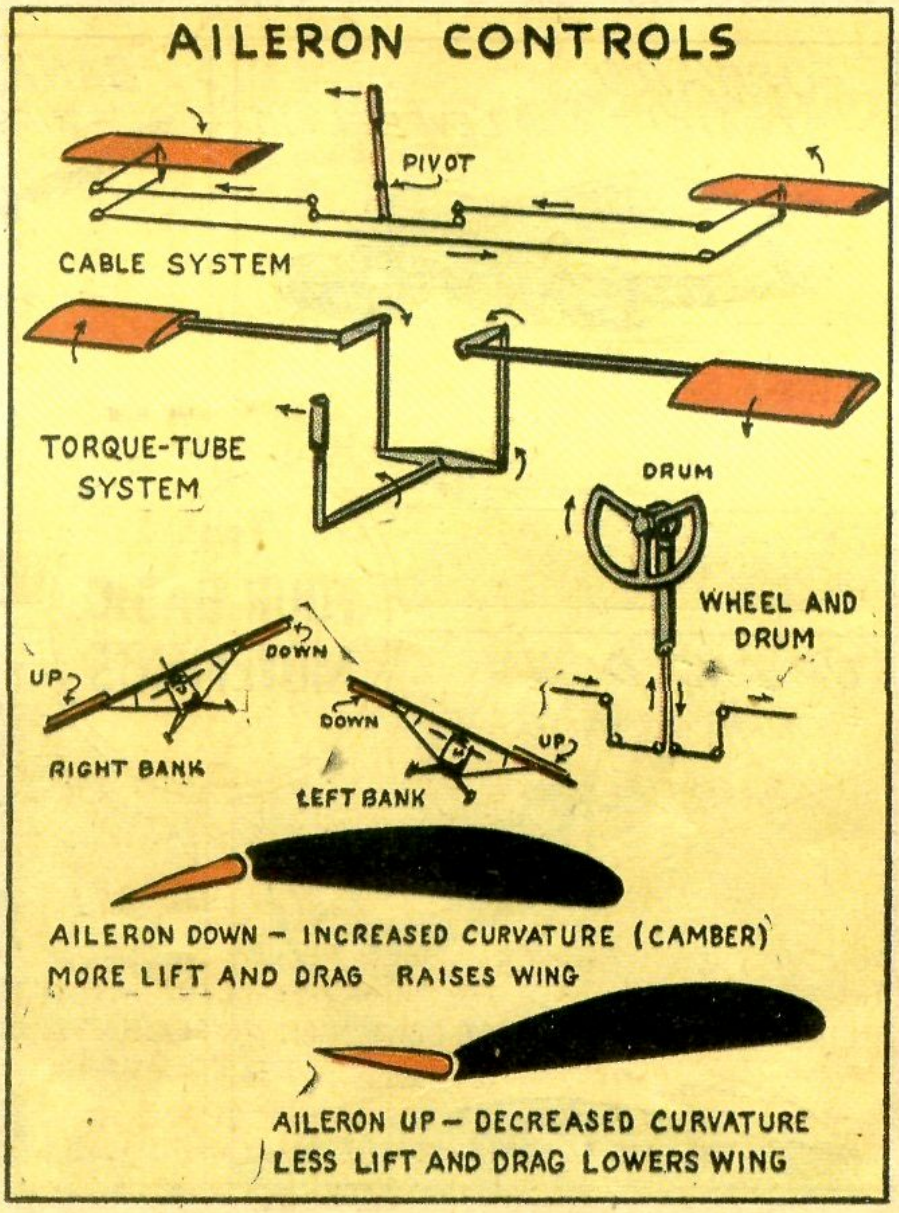
The wings and tail plane surfaces of an airplane give it stability and keep it steady and level in its relative wind.

When a momentary impulse, such as a sudden gust of wind, causes the plane to yaw in one direction or another, the vertical fin sets up counteracting forces which bring the plane back to its original attitude. This is known as directional stability. In the same way, any inclination of the plane to nose downward into a glide or dive, or to nose upward in a climb, is corrected by the horizontal surfaces of the tail plane, known as the stabilizer. The wings and the characteristics of their design correct any sudden tendency of the plane to roll.

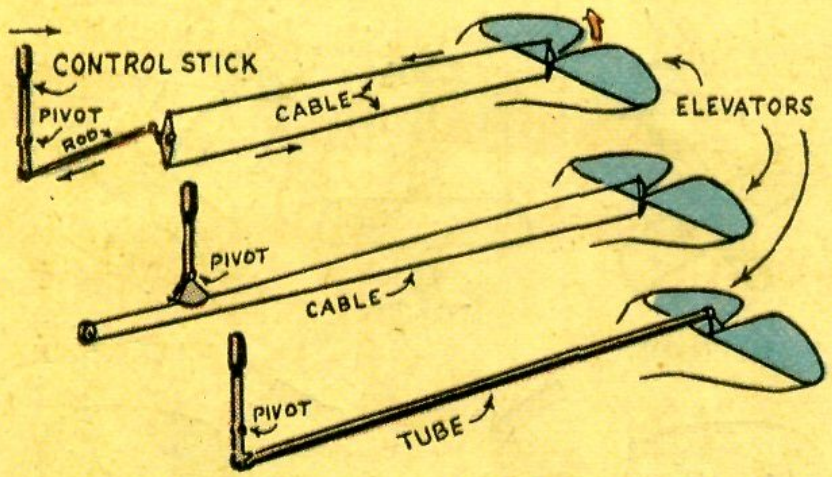
An airplane is in balance and all of its turning effects are in balance normally as it flies on a straight and level course.

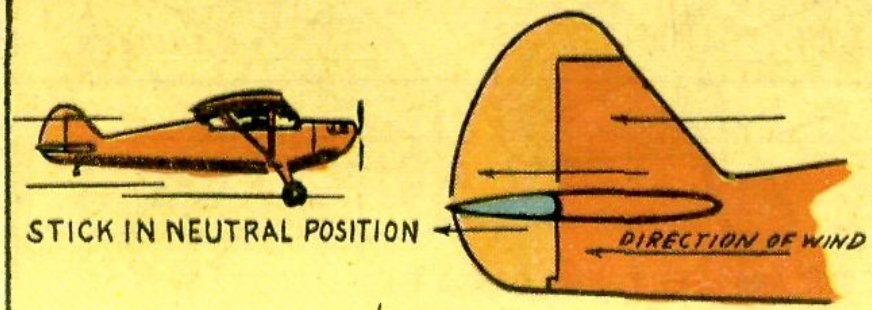
There are three sets of control surfaces which give an airplane mobility. They are movable continuations of the airfoils which are used for balance and stability. The rudder is a movable continuation of the vertical fin. The elevators are movable continuations of the horizontal stabilizer. The ailerons are built into the airplane wings.

The rudder enables the pilot to steer his plane, by causing it to turn on its vertical axis. From the cockpit, the rudder is manipulated by means of two pedals.

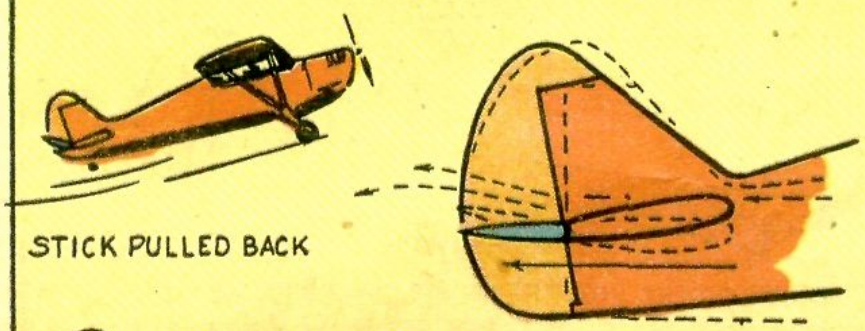


ELEVATOR CONTROLS

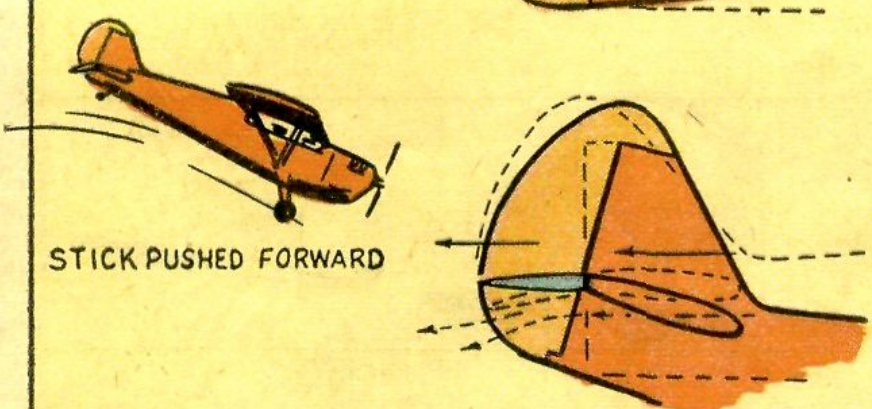




STICK IN NEUTRAL POSITION



STICK PULLED BACK



STICK PUSHED FORWARD

PULLING THE STICK BACK RAISES THE ELEVATOR, CHANGING THE ANGLE OF ATTACK OF THE TAIL. SUBSEQUENT INCREASE IN LOAD CAUSES IT TO DROP. THIS DROP INCREASES THE ANGLE OF ATTACK OF THE AIRPLANE AND IT GOES UP.

PUSHING THE STICK FORWARD LOWERS THE ELEVATOR, CAUSING THE TAIL TO RISE, AND THE AIRPLANE GLIDES.

When the right pedal is depressed, a cable linkage connected to the right side of the rudder is pulled forward and the rudder swings to the right.

This new position of the rudder throws the airplane out of balance on its vertical axis. The pressure on the right side of the tail plane becomes greater than on the left side, with the result that the plane turns on its vertical axis, with the tail moving to the left and the nose moving to the right. The right pedal turns the nose of the plane to the right, the left pedal turns the nose of the plane to the left.

The rudder alone, however, is not sufficient to provide control of the lateral direction of the plane. The use of the rudder must be accompanied by the banking of the plane in order to avoid skidding or a flat spin.

Banking is the turning of the plane on its longitudinal axis, which runs from the plane's nose to its tail. The banking of the plane is accomplished by manipulation of movable sections of the trailing edges of the wings. A lever in the cockpit, known as the stick, is used to manipulate the ailerons. When the stick is moved to the right, the aileron in the right wing is raised and the aileron in the left wing is lowered, and the plane banks to the right.

The reason the plane banks to the right is because the raised trailing edge of the right wing reduces the over-all camber of the wing and thus reduces its lift, whereas the lowered trailing edge of the left wing increases the camber of the left wing and increases its lift.

The stick, which is immediately in front of the pilot's seat in the cockpit and is sometimes topped with a wheel or half-wheel, is also used for one other important control function. This is the regulation of the elevators.

The elevators are movable continuations of the horizontal stabilizer and are hinged to it. When the stick is moved forward, the trailing edge of the elevators are raised. When the stick is moved backward, toward the pilot, the trailing edge of the elevators are lowered. When the elevators are raised, the top pressure against them is increased, causing the tail of the plane to be lowered and the nose to be raised.

The airplane then follows in the same direction in which the stick is turned. If the stick is pulled backward, the airplane

(CONTINUED ON NEXT PAGE)

climbs. If the stick is pushed forward the airplane noses down into a glide. If pushed to the left, it banks to the left. If pushed to the right, it banks to the right.

Unlike an automobile in turning, it is not necessary to hold the control of an airplane until the turn has been completed. For example, only a slight pressure is applied to the rudder to start the nose swinging in its turn. At the same time the stick is pushed slightly in the same direction to create the required bank. When the proper degree of bank has been reached the pressure on the rudder is removed and the stick is returned to its neutral position. The plane then continues in its turn until a slight pressure in the opposite direction returns it to level flight.

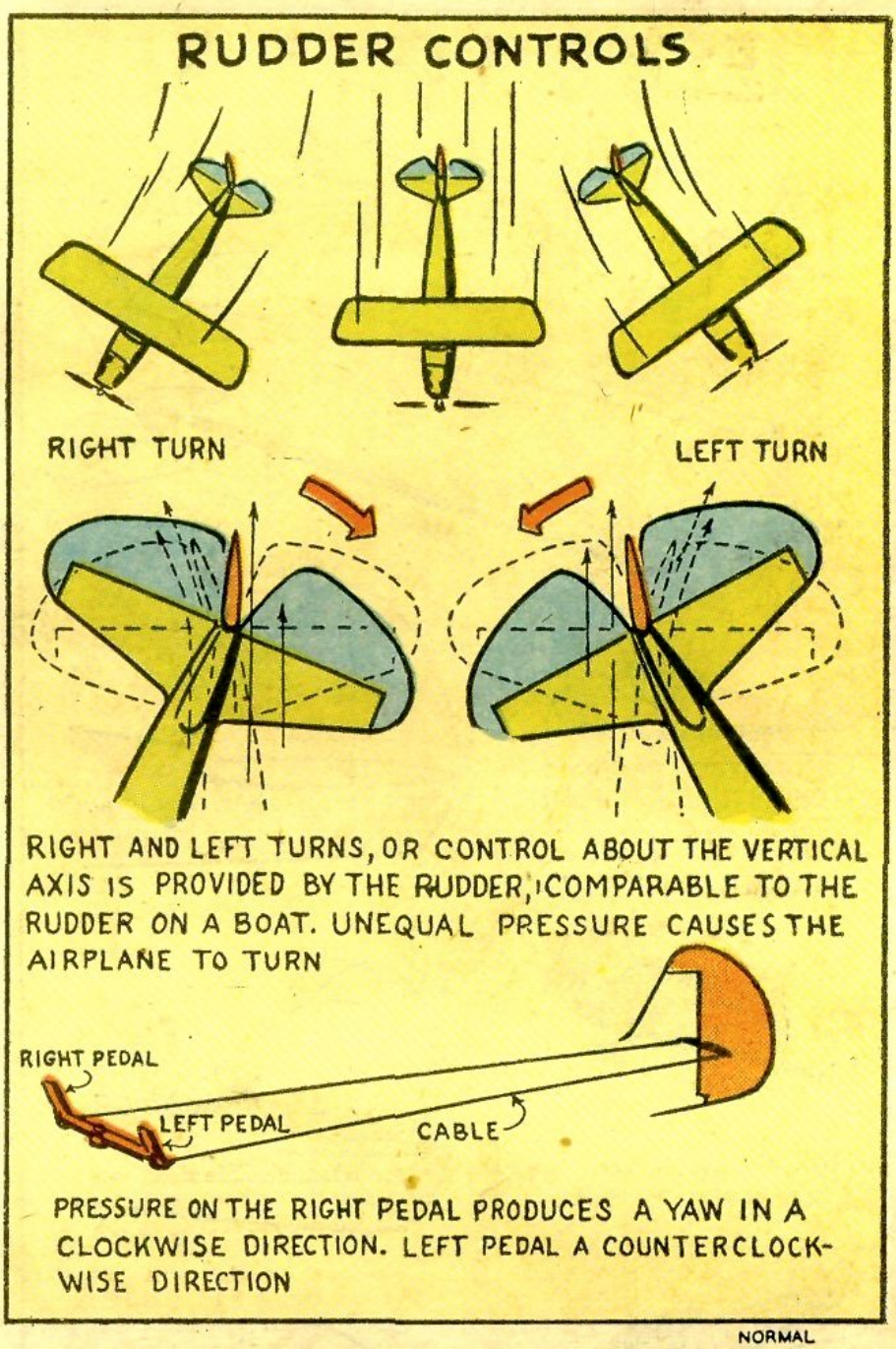
A glide is achieved by throttling the engine back. Then the nose is allowed to drop slightly below the horizon by relaxing back pressure on the stick.

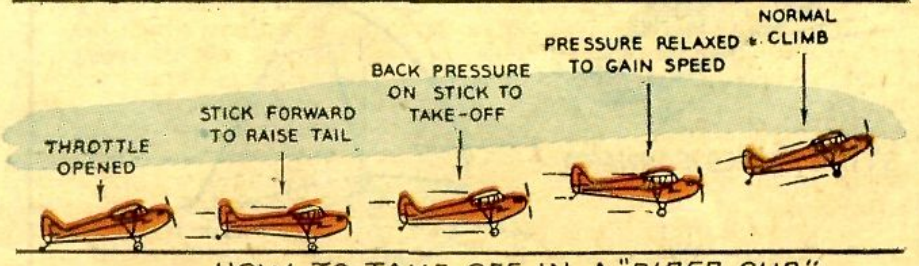
The procedure for taking an airplane off the ground is comparatively simple. It involves only keeping the ship headed straight into the wind, maintaining a safe margin of speed and keeping the wings level. Here, for instance, are instructions for taking-off and landing a Piper Cub.

First, the throttle is eased to full-open position and the stick is pressed forward to raise the tail. The ship picks up speed in this level position and it is kept straight with the rudder. As flying speed is attained, a slight back pressure on the stick will lift the ship from the ground. This back pressure is then momentarily relaxed to gain extra speed, after which it is reapplied to establish and maintain a normal climb.

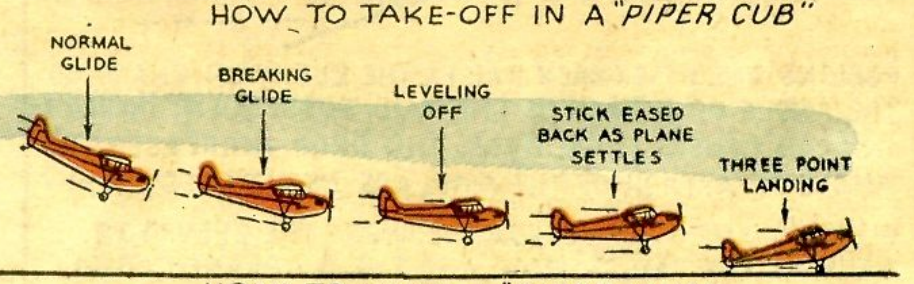
Landing an airplane requires the development of accurate judgment of distances, known as depth perception, and a good speed sense.

The ship approaches the landing area in a normal glide, headed into the wind, with engine idling. When between 10 and 15 feet from the ground a slight back pressure on the stick is begun to break the glide and bring the plane to level flying position. As the ship loses speed it gradually settles. During this settling the stick is slowly pressed back to get the tail down and, as the plane finally loses its flying speed, it settles to the ground in three-point position. Wings are kept level with the ailerons throughout the landing.





HOW TO TAKE-OFF IN A "PIPER CUB"



HOW TO LAND A "PIPER CUB"

WORLD'S FIRST AERIAL BOMBING

By HOWARD KEGLEY



ALTHOUGH Glenn L. Martin made the first bomb sight, carried on the first aerial bombing experiments, constantly urged the development and use of aeroplanes for military purposes, and personally conducted the first aerial bombardment tests for the Ordnance Department and United States Signal Service, it remained for a foreigner flying a Martin biplane in a foreign land to first use an aeroplane for bombing during a military engagement.

It was in 1913 that Didier Masson, a French flyer, visited Los Angeles and bought from Glenn Martin one of his newest models, ostensibly for use in stunt flying on barnstorming tours over the county fair and carnival circuit in this country. The Huerta insurrection against the Diaz administration in Mexico was then in progress.

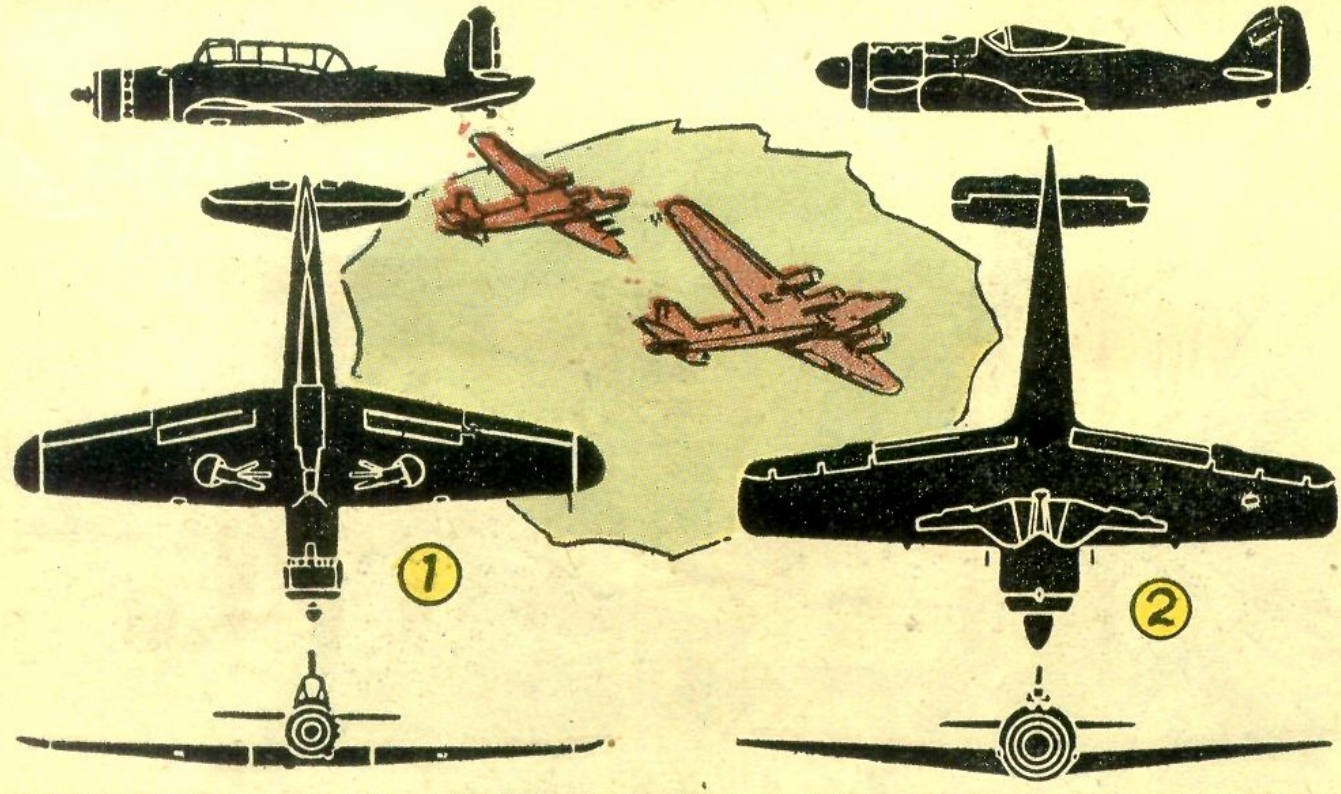
One day Martin picked up a Los Angeles newspaper and read a dispatch which stated that at a time when the Mexican army had apparently been successful in holding off Huerta's forces at the gates of the beleaguered city of Guaymas on the west coast of Mexico there had suddenly appeared from behind the rebel lines an aeroplane which flew at an astonishing rate of speed.

While soldiers and citizens gazed in mute astonishment the aviator skimmed low over residences and business establishments, releasing here and there clusters of explosive missiles which struck terror to the hearts of citizens. The dispatch said: "bombs fell in the principal streets, causing some loss of life and much damage."

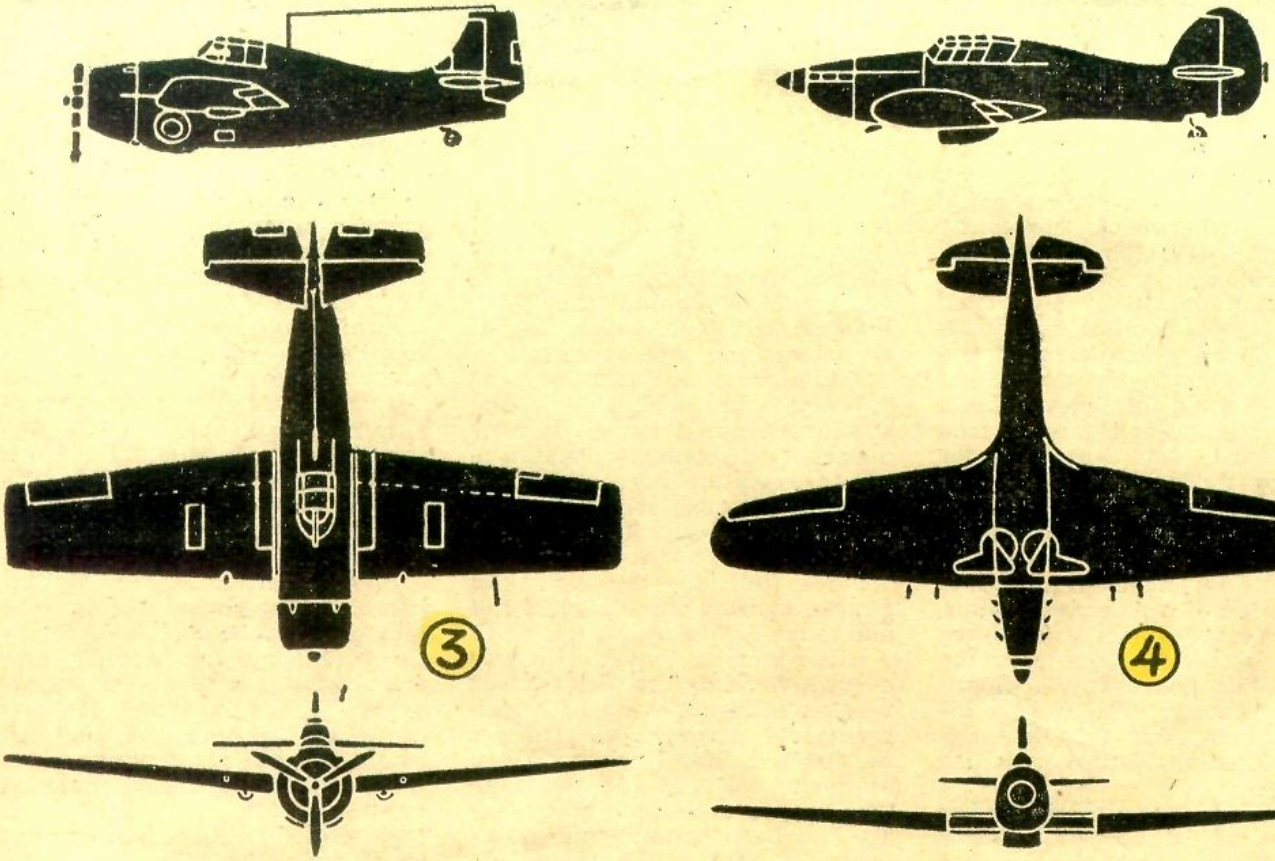
Little wonder that Martin was overwhelmed by the incident. It was an experiment he had been trying for several years to get the United States army to try on home soil. It did not take him long to determine that Masson had been bombing the Mexican city with a Martin plane. Today that newspaper clipping occupies a prominent position in Martin's scrapbook dealing with pioneer aeroplane episodes.

Was the Guaymas incident the first aerial bombardment in military annals? Opinions concerning this are numerous, and there has been a great deal of argument over that point. In Europe they contend that the French airship Fleurus I showered 155-millimeter cannon shells on Konz Kartaus, Germany, during August of 1914, but that was fully a year after the bombing episode at Guaymas.

Shortly after Didier Masson bombed Guaymas during the Mexican revolution Glenn Martin completed the world's first armor-clad aeroplane—a tractor plane, the engines and cockpits of which were sheathed with bright metal. The wings were made of transparent material because it was thought that they would be difficult to see at an altitude of a mile or more.

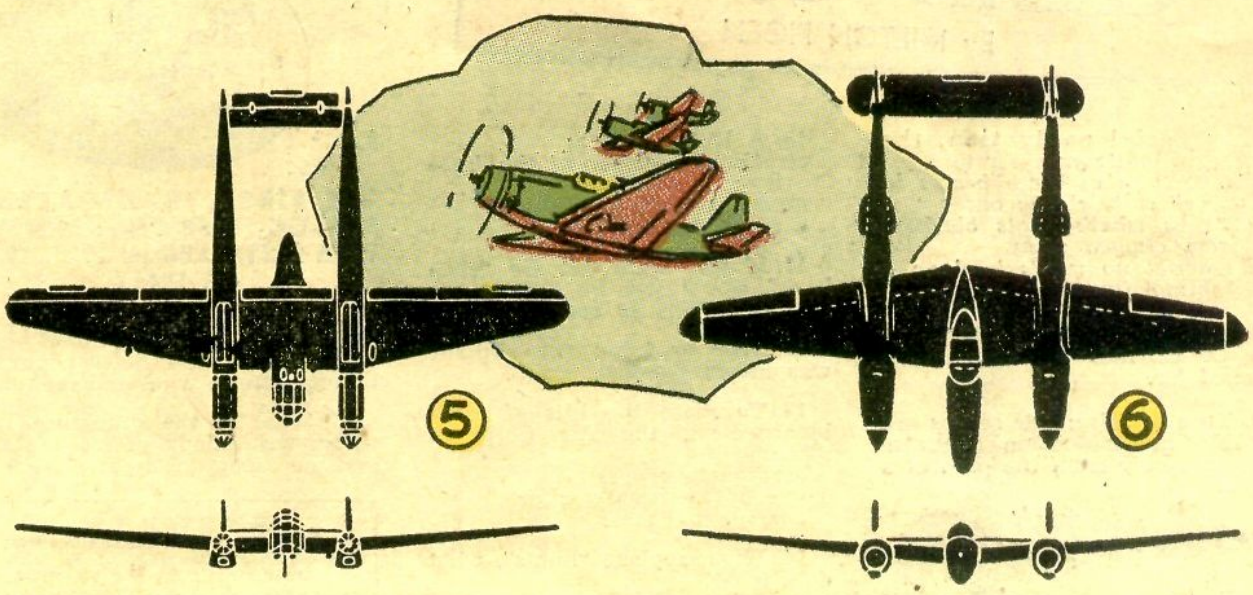


WHICH IS WHICH? *Friend or Foe*

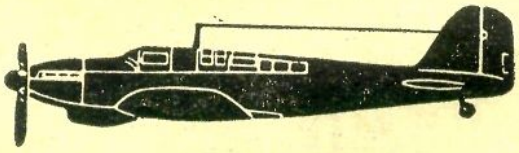


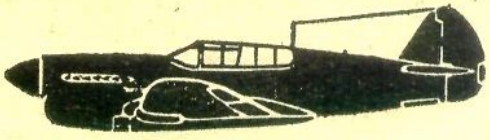


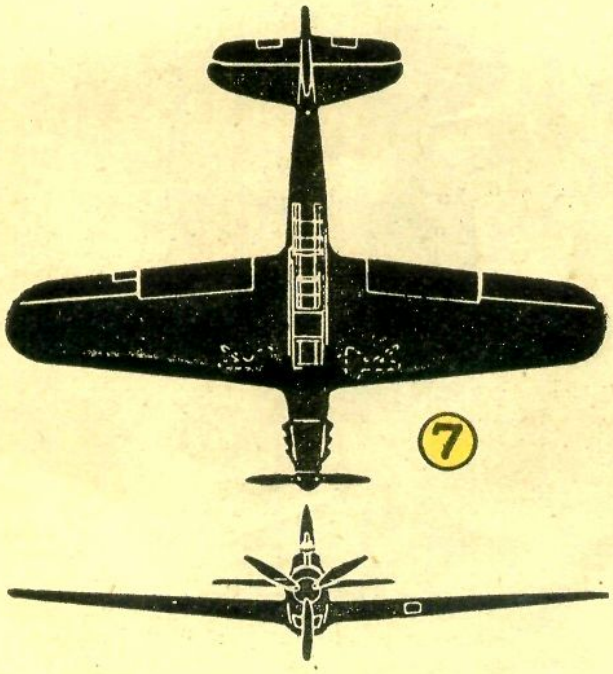


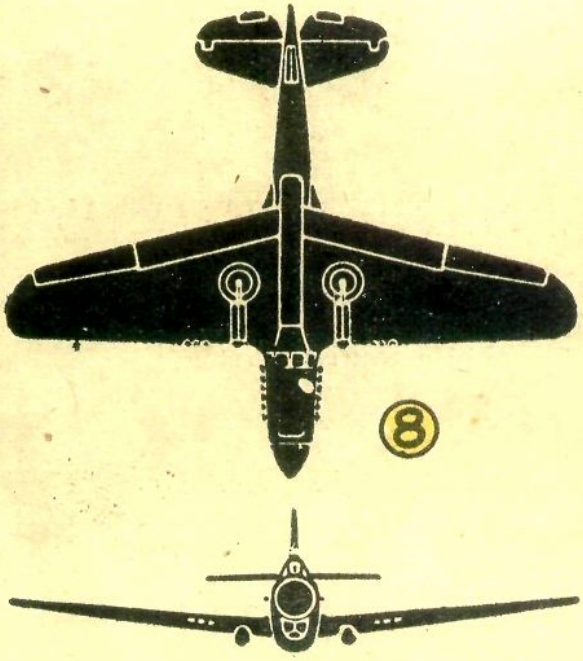


? A remarkable resemblance between the outline appearance of certain airplanes makes it difficult to distinguish between Allied and Axis ships. Yet, there are minor differences that can be detected. Can you spot them? There is one Allied and one Axis plane in each pair on these two pages. Can you tell which is which and can you identify each plane by its name and nationality? Correct answers and the identification of each plane will be found on Page 58.









CADET QUIZ?

By MILTON FIGEN

1. In aerial navigation, the words *twilight zone* refer to:
the portions of radio beams in which signals fade out
altitudes where pilots blackout from oxygen want
the aerial no man's land on a fighting front?

2. Translate: The adman threw the O. C. into a brodie, then hoicked 'er.

3. True or false: Air scoops are of help in streamlining because they scoop air from the path of a plane?



A.

AMONG ARMY BOMBER SQUADRONS, WHEN IS A PIECE OF CAKE NOT A PIECE OF CAKE?

4. Kites, gliders, helicopters, flying wings and autogiros are all alike in what major respect?

5. The boredom military pilots are likely to acquire when grounded too long by bad flying weather can be described as a:
washed-in browned-off
wingheavy or empty weight
feeling. Which is correct?

6. One half of a snap roll putting a ship on its back is called a flip, a flap, or a flop?

7 The aerial disease equivalent to the "bends" among divers is called:
dioxidosis euphoria altidemia
anoxia or aeroembolism?

8. What are the real names of the following RAF planes? Get three out of four· *Daffy, Lizzie, Spit, Maggie.*

9. Who is the Waterproof, La. ex-school teacher who has been described as the outstanding air soldier of the war?

10. A *longeron* is a:
structural member of the fuselage
an army pilot's bathrobe or a target sleeve in tow?

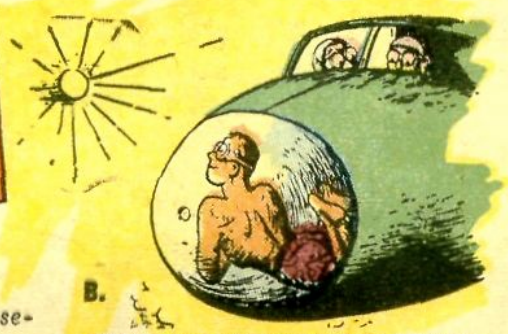
11. If you were out for "rhubarb" would you be looking for ground targets or enemy planes?

12. True or false: the airplane was invented before radio?

13. To score the hits of cadet bombardiers, the Air Corps is using:
earthquake waves
stereopticon cameras or barrage balloons?

14. When a plane "hunts", what does it do?

15. The patron saint of aviators is:
St. Peter St. Bartholomew
St. Anthony · or St. Francis?



B.

THE FIRST TRANSPARENT PLASTIC NOSE ON A BOMBER WAS INSTALLED IN 1921, 1931 OR 1941?

16. Is an air-blind pilot one whose vision has been impaired by exposure to wind and sunlight?

17. What is the difference between the canopy of an airplane and the canopy of a parachute?

ANSWERS

HOW *well do you know the terms* which are common among military airmen? Count five points for each question answered correctly. A score of 85 is excellent, 75 is good, 60 is average. Answers to the questions appear on Page 58. Put your friends through this test and see if they can do any better.

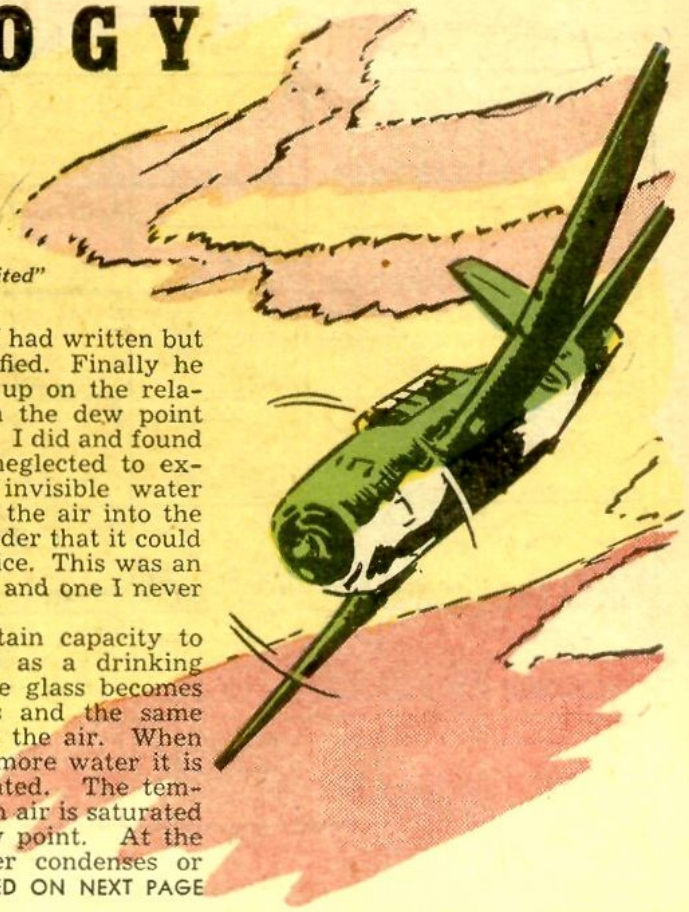


C.

All Englishmen like Clara. Who is she?

METEOROLOGY
SIMPLIFIED

By ERNEST G. VETTER
LIEUTENANT, U.S.N.R.
Author of "Let's Fly" and "Visibility Unlimited"



MORE years ago than I care to remember I was taking my examination for a Transport Pilot's Certificate. Having completed an excellent course in meteorology shortly before, given by the Army, I felt pretty confident about that part of the examination.

One of the questions was, "What are the conditions under which ice will form on an aircraft in flight?"

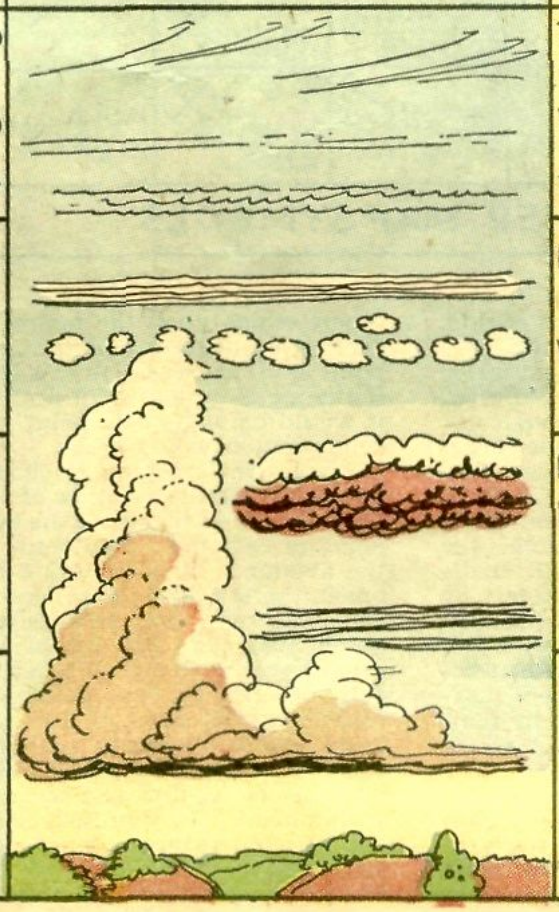
In answer to this question I explained very carefully that the temperature must be freezing or below and that there must be moisture in the air in order to freeze into ice.

After the inspector had read and corrected my paper he called me in. He questioned me verbally regarding ice formation. I repeated what I had written but he was not satisfied. Finally he told me to read up on the relationship between the dew point and temperature. I did and found out that I had neglected to explain how the invisible water vapor got out of the air into the visible state in order that it could freeze and form ice. This was an important lesson and one I never forgot.

Air has a certain capacity to hold water just as a drinking glass. When the glass becomes full it overflows and the same thing happens to the air. When air can hold no more water it is said to be saturated. The temperature at which air is saturated is called the dew point. At the dew point, water condenses or

CONTINUED ON NEXT PAGE

FAMILY	TYPE	ABBREVIATION	BASE LEVEL FEET	DESCRIPTION
A HIGH CLOUDS	1 CIRRUS	Ci	32000	Thin, wispy feather-like
	2 CIRRO-STRATUS	Cs	28000	Very thin sheetlike
	3 CIRRO-CUMULUS	Cc	22000	thin, flakelike
B MIDDLE CLOUDS	4 ALTO-STRATUS	As	17000	Medium, high, sheetlike
	5 ALTO-CUMULUS	Ac	15000	Woolly, sheepbacklike
C LOW CLOUDS	6 STRATO-CUMULUS	Sc	5000	Rolls, gobular masses
	7 NIMBO-STRATUS	Ns	3000	Low, amorphous rainy
	8 STRATUS	St	2000	Low, sheetlike
D VERTICAL CLOUDS	9 CUMULUS	Cu	1500	Dome-shaped, dense
	10 CUMULO-NIMBUS	Cb	1500	Towerlike cauliflower like, cirrus top.



C_L	C_M	C_H	N	a
0 NO LOWER CLOUDS	0 NO MIDDLE CLOUDS	0 NO HIGH CLOUDS	0 ABSOLUTELY NO CLOUDS IN SKY	0 RISING, THEN FALLING
1 CUMULUS OF FINE WEATHER	1 TYPICAL ALTOSTRATUS, THIN	1 CIRRUS, DELICATE, NOT INCREASING, SCATTERED AND ISOLATED MASSES	1 LESS THAN ONE TENTH	1 RISING, THEN STEADY, OR RISING, THEN RISING MORE SLOWLY
2 CUMULUS HEAVY AND SWELLING, WITHOUT ANVIL TOP	2 TYPICAL ALTOSTRATUS THICK (OR NIMBOSTRATUS)	2 CIRRUS, DELICATE, NOT INCREASING, ABUNDANT BUT NOT FORMING A CONTINUOUS LAYER	2 ONE TENTH	2 UNSTEADY
3 CUMULONIMBUS	3 ALTOCUMULUS, OR HIGH STRATOCUMULUS SHEET AT ONE LEVEL ONLY	3 CIRRUS OF ANVIL CLOUDS, USUALLY DENSE	3 TWO OR THREE TENTHS	3 STEADY OR RISING
4 STRATOCUMULUS FORMED BY THE FLATTENING OF CUMULUS CLOUDS	4 ALTOCUMULUS IN SMALL ISOLATED PATCHES: INDIVIDUAL CLOUDS OFTEN SHOW SIGNS OF EVAPORATION AND ARE MORE OR LESS LENTICULAR IN SHAPE	4 CIRRUS, INCREASING GENERALLY IN THE FORM OF HOOKS ENDING IN A POINT OR IN A SMALL TUFT	4 FOUR, FIVE OR SIX TENTHS	4 FALLING OR STEADY, THEN RISING OR RISING, THEN RISING MORE QUICKLY
5 LAYERS OF STRATUS OR STRATOCUMULUS	5 ALTOCUMULUS ARRANGED IN MORE OR LESS PARALLEL BANDS OR AN ORDERED LAYER ADVANCING OVER THE SKY	5 CIRRUS (OFTEN IN POLAR BANDS) OR CIRROSTRATUS ADVANCING OVER THE SKY BUT NOT MORE THAN 45° ABOVE THE HORIZON	5 SEVEN OR EIGHT TENTHS	5 FALLING, THEN RISING
6 LOW BROKEN UP CLOUDS OF BAD WEATHER	6 ALTOCUMULUS FORMED BY A SPREADING OUT OF THE TOPS OF CUMULUS	6 CIRRUS (OFTEN IN POLAR BANDS) OR CIRROSTRATUS ADVANCING OVER THE SKY AND MORE THAN 45° ABOVE THE HORIZON	6 NINE TENTHS	6 FALLING, THEN STEADY, OR FALLING, THEN FALLING MORE SLOWLY
7 CUMULUS OF FINE WEATHER AND STRATOCUMULUS	7 ALTOCUMULUS ASSOCIATED WITH ALTOSTRATUS OR ALTOSTRATUS WITH A PARTIALLY ALTOCUMULUS CHARACTER	7 VEIL OF CIRROSTRATUS COVERING THE WHOLE SKY	7 MORE THAN NINE TENTHS BUT WITH OPENINGS	7 UNSTEADY
8 HEAVY OR SWELLING CUMULUS, OR CUMULONIMBUS, AND STRATOCUMULUS	8 ALTOCUMULUS CASTELLATUS, OR SCATTERED CUMULIFORM TUFTS	8 CIRROSTRATUS NOT INCREASING AND NOT COVERING THE WHOLE SKY	8 SKY COMPLETLY COVERED WITH CLOUDS	8 FALLING
9 HEAVY OR SWELLING CUMULUS (OR CUMULONIMBUS) AND LOW RAGGED CLOUDS OF BAD WEATHER	9 ALTOCUMULUS IN SEVERAL SHEETS AT DIFFERENT LEVELS, GENERALLY ASSOCIATED WITH THICK FIBROUS VEILS OF CLOUD AND A CHAOTIC APPEARANCE OF THE SKY	9 CIRROCUMULUS PREDOMINATING ASSOCIATED WITH A SMALL QUANTITY OF CIRRUS	9 SKY OBSCURED BY FOG, DUSTSTORM OR OTHER PHENOMENON	9 STEADY OR RISING, THEN FALLING; OR FALLING, THEN FALLING MORE QUICKLY

WEATHER MAP SYMBOLS

precipitates into the form of rain, fog, dew, clouds, snow, etc.

Let us suppose that saturated air is heated. It will be affected in the same way as though our drinking glass were made larger—it will hold more water. The opposite happens when heat is taken from the air. The air is then affected as though the drinking glass were made smaller—it will hold less water. So we can say that when any volume of air is saturated, or at its dew point, that any decrease in temperature will result in condensation, and any increase in temperature will enable the air to hold more water.

Another way to discuss dew point is to say that it is the temperature to which air must be cooled for precipitation to occur. For example, let's take a weather report which gives the temperature as 80 degrees and the dew point as 70 degrees. In this case if the air is cooled to 70 degrees it would be at its dew point and condensation would occur.

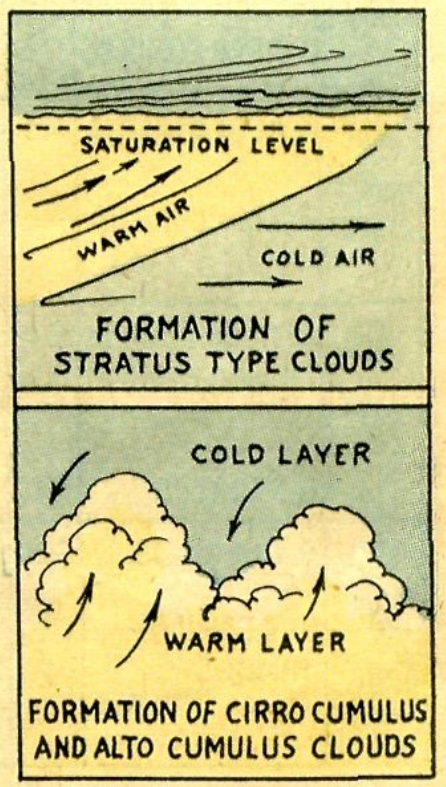
From the foregoing it should be plain that the relation of the temperature of the air to the dew point is extremely important to the aviator. When they are far apart, there is little likelihood of rain, fog, snow, etc., because the water just can't get out of the atmosphere until the air becomes full—reaches its dew point and overflows. But when the dew point and temperature are close together, say within about 5 degrees, some kind of bad weather is imminent. If, simultaneously, the air temperature is at or below freezing, there is danger of ice. This is the point that the inspector was trying to develop when questioning me on my Transport Pilot's examination. As ice is one of the greatest hazards to aviation the significance of the dew point and temperature becomes evident.

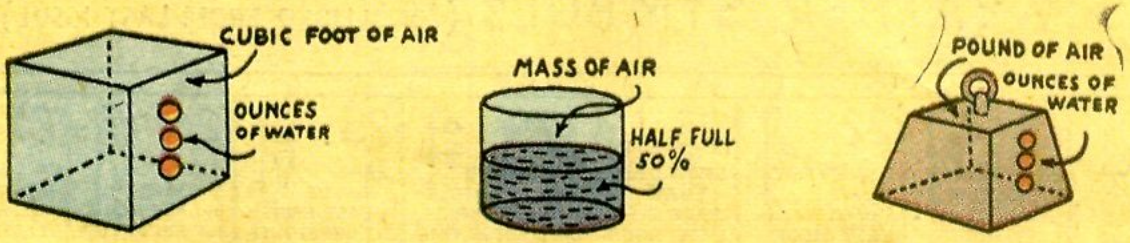
The dew point is always given with the temperature in aviation weather reports. The farther apart the air temperature and the dew point, the clearer the weather. When the difference becomes 5 degrees or less, watch out.

Most every one has seen the condition where with a clear sky on a cool night fog forms in the low places. This fog is called advection fog and occurs because the air is moist and the loss of heat by radiation lowers the air temperature to its dew point. Radiation fog is born when warm moist air from the south moves over colder surfaces to the north, and is cooled to the dew point.

Air is also cooled by vertical movement. When air rises in a convection current or because it has been pushed up the side of a mountain or a front it cools at the rate of about 3 degrees per thousand feet. Thus air that has a temperature of 70 degrees and a dew point of 61 degrees at the ground will produce clouds if raised to 3000 feet.

Clouds are not necessarily a hazard to aviation unless they are too low. There are 10 basic types classified according to their





HUMIDITY MEASUREMENTS

form and appearance. They are divided into families according to the altitude at which they are commonly found.

Family A are the high clouds whose lower levels average 20,000 feet. In this group are the cirrus, cirrocumulus and the cirrostratus.

In family B we have the middle clouds, altocumulus and altostratus. These clouds range from 20,000 feet down to 6500 feet.

The low clouds are family C, whose tops are below 6500 feet, with cases close to the ground. Stratocumulus, stratus and nimbostratus make up this group.

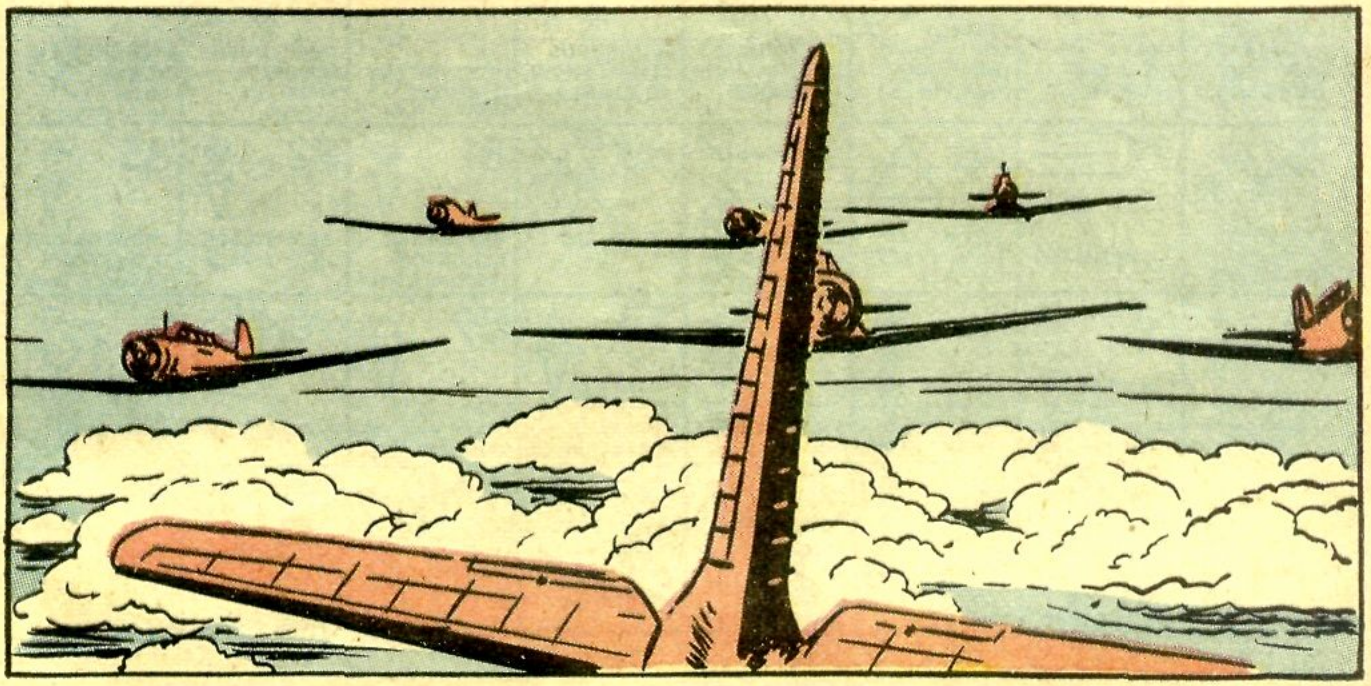
The fourth group is family D, clouds with vertical development. These clouds, cumulus and cumulonimbus, may extend from 1500 feet upward to 20,000 feet.

In measuring the amount of water vapor in the air the terms relative humidity, absolute humidity and specific humidity are used. Relative humidity is the percentage of water vapor that the air holds compared to what it could hold at the same temperature. In other words, if air has half the water it could hold, or is half way saturated, it has a relative humidity of 50 per cent. Absolute humidity is the weight of the water in a given volume of air. Expressed in grams of water per cubic centimeter, it would be expressed in this country as ounces—or fractions of an ounce—of water per cubic foot of air. Specific humidity is the mass of water vapor contained in a mass of moist air. It is expressed in grams of water in a given number of grams per air. Or, to get away from the metric system, consider it as the number of ounces of water in a pound of air.

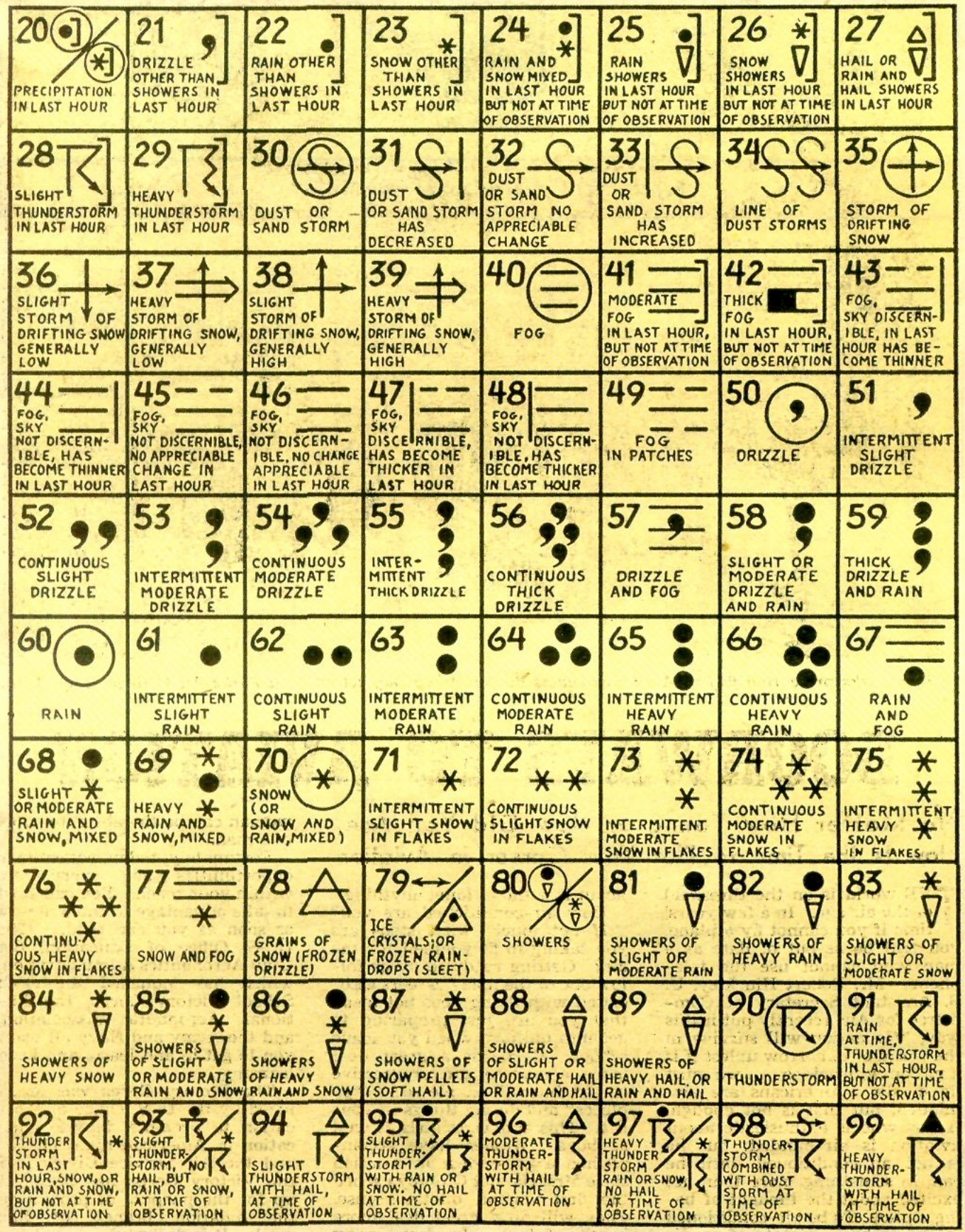
Humidity is measured by use of a psychrometer. This instrument consists of two thermometers attached together to a chain. One of these thermometers has a muslin covering over the bulb. This muslin is wetted with pure clean water and both thermometers are whirled through the air. As the water evaporates from the muslin it takes heat from the bulb causing a lower reading in that thermometer. The difference in reading between the two thermometers is taken and this is called the depression. From this depression the dew point and humidity measurements can be obtained by reference to psychrometric tables.

Most of the hazards of aviation are associated with the moisture content of the air. Clouds, fog, drizzle, ice, sleet, rain and snow all are the result of water vapor becoming visible.

The wise pilot watches his dew point and temperature reports for he knows what they portend.



WEATHER SYMBOLS (CONCLUDED FROM LAST ISSUE)





Oliver Parks presenting flag to Air Force cadets during Army Day activities at Parks Air College, E. St. Louis.

DOORWAYS TO AVIATION

No Matter How Young or How Old You Are, Now Is the Time to Plot Your Career in Aviation

THE world is on the threshold of the air age. In a few years' time if you cannot fly a plane, you will be as out of date as a man who cannot use the telephone. Mr. Robert Hinckley, U. S. Assistant Secretary of Commerce for Air, recently put it this way, "No nation will survive in the world of tomorrow unless it is a nation with wings . . . we must fly or die. Americans are air-minded, but that is not enough. A boy who is enthusiastic about aviation is air-minded; but he is not air-conditioned until he can do something more than get excited about the thought of being a pilot. To be air-conditioned means to be in a state of readiness to do something about aviation and not just feel strongly about it without doing anything."

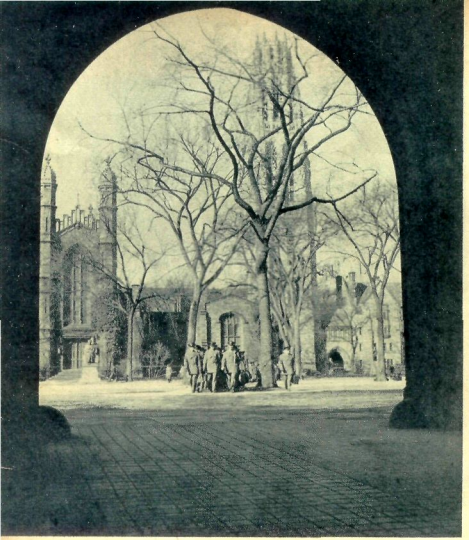
How air-conditioned are you?

If not much, what steps are you taking to fit yourself for the air? Getting ready to fly or follow one of the many careers associated with flying does not mean that you are just preparing to get into uniform when you leave school. It means a great deal more, a modern and progressive career that will enable you to "go places" and do big things in your life. This applies to girls as well as boys. Women have accomplished a great deal in aviation since Mrs. Harriet Quimby earned the first woman pilot's license. They will do a great deal more in the future. In fact, many people believe that aviation is the sole industry in which a woman can be the absolute equal of a man.

Fortunately, today, educational opportunities are everywhere within your reach. You can start to take advantage of them almost as soon as you can read. The U. S. Office of Education, the Civil Aeronautics Administration, which has launched the High School Victory Corps, the National Aeronautic Association, and the Army and Navy all want you to get in and learn, and keep learning.

The Victory Corps was organized by the U. S. Office of Education to promote defense education in American high schools, and the Air Service Division of the Victory Corps has been set up for the purpose of promoting the aviation branch of this work. It is designed particularly to enable you to take part in the

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YALE UNIVERSITY has taken 3,000 cadets under its wing for pre-flight training. Graduates will be in command of ground crews.

UNDERGRADUATES and cadets at Yale fraternize under New Haven's historic porticos. Army has taken half of Yale's facilities.



war effort and to equip yourself for a position in civil aviation after the war.

The first stage in the training is what is popularly known as Pre-Flight. To qualify for flying training, you must take the normal high school courses of mathematics, physical training, military drill, and aeronautics, or one of the many aviation trade courses that are available. When you are through with this course, which is now operating in many thousands of high schools, you should be ready-made material for naval or military flying.

The courses available to you, under the Victory Corps program, in addition to Pre-Flight aeronautics, include air-age geography, meteorology, aviation mathematics, and the all-important aviation trades of welding, sheet metal work, wood work, elementary design, navigation, and parachute instruction.

The actual flying instruction is a separated activity, given by specially selected flying schools with civilian instructors. There are two courses available, elementary and secondary, from which pilots then go to specialized training with the Army or Navy. There are already seven hundred of these training centers in operation in this country.

If you are at college, you can avail yourself of the opportunities offered by both the Army and Navy to train as a specialist in aviation. The Secretary of War, Henry L. Stimson, and Secretary of the Navy Knox recently issued a joint statement to the effect that the Army, Navy, Marine Corps, and Coast Guard were using the resources of the universities and of the colleges in the country, even though reduction of the draft age to eighteen years tends to eliminate the principal source of men college students.

Under the new plan, the Army and Navy contract with selected colleges and universities to furnish instruction for boys who are to continue their education in certain fields after becoming members of the armed forces.

Particularly interesting in the Army's scheme is the fact that junior students in the enlisted reserve corps who are following approved technical courses can continue their studies through the academic semester, if they are to be inducted before June, 1943. On graduation they are available for training in an Officer Candidate School, recommended to be technical non-commissioned officers, or in

exceptional cases sent to advanced technical training schools, or as the Army terms it, in very exceptional cases, made available for technical work which is outside the Army but important to the war effort.

The Navy college training program offers opportunity to study for Navy commissions to high school graduates or students with equivalent education from the ages of 17 to 19. If you are an enlisted man between the ages of 17 and 22, you can apply to your commanding officer for recommendation to attend one of the selected colleges and universities.

Programs of study last from eight to twenty-four months. The first eight months, which is the same for all students, concentrates on fundamental college work in mathematics, science, English, history, mechanical drawing, and physical training. The Navy program, which is known as the V-12, aims to absorb most of the college students now enlisted in the Navy and Marine Corps Reserve. While at college, the students are rated as apprentice seamen of the United States Naval Reserve, and wear the uniform required.

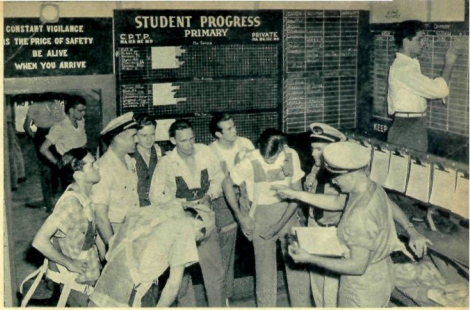
The Navy has announced that the following classes of civilians are eligible to take the tests:

(1) High school or preparatory school graduates who have attained their seventeenth birthday and not their twentieth by July 1, 1943, regardless of whether they are attending college.
(2) High school or preparatory school seniors who will be graduated by July 1, 1943, between the ages of seventeen and twenty.
(3) Students who do not hold certificates of graduation from a secondary school, but who are continuing their education at a college or university, and are between the ages of seventeen and twenty on July 1, 1943.

During the college training, Navy students may take part in all college activities, provided such activities do not interfere with study hours. They are permitted to join all previously established college organizations and fraternities, but they must at all times maintain the Navy standards of discipline. Full particulars of the plan may be obtained from your local Navy Procurement Office.

The Navy has leased the University of Iowa, St. Mary's Uni-

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CIVIL AERONAUTICS ADMINISTRATION tossed its vast CPTP organization into a pool for joint Army-Navy-CAA War Training Service.



PARACHUTE TRAINING *was on the regular CPTP program. The picture shows students at a typical school, Meacham Field, Fort Worth.*

LIGHT PLANES *are used in the 700 training centers of the War Training Service. Below is picture from Ellenburg Field, Washington.*





WOMEN INSTRUCTORS at Yale University are known as WIRES (Women in Radio Electronics School). Thora Sheppard is shown above.



FOURTEEN THOUSAND HIGH SCHOOLS in the United States are taking part in an aviation program sponsored by U. S. Office of Education.

versity in California, the University of North Carolina, and the University of Georgia for training Navy fliers. The qualification is two years of college training or its equivalent, and passing the Navy physical examination.

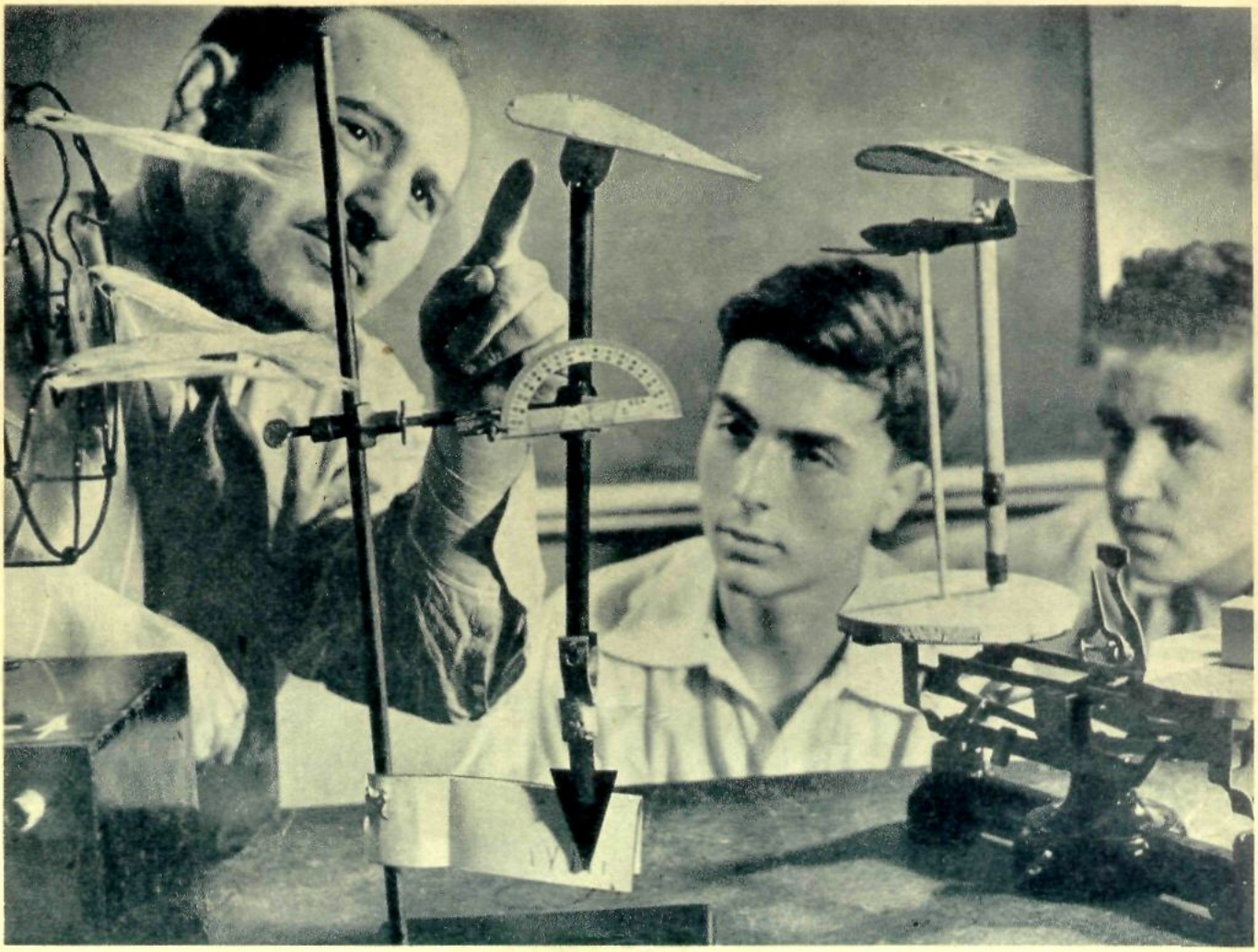
The Navy outlines the phases of its flight training program thus:

(1) Flight preparatory school—three months.
(2) War Training Service, C. A. A. flight instruction—two months.
(3) Pre-flight training, physical conditioning—three months.
(4) Primary flight training—two months.
(5) Intermediate flight training three months.
(6) Operational training—two months.

Applicants who have been through the air service training of the Victory Corps, or who have trained at commercial flying schools, complying with the regulations of the C. A. A., can apply directly to the Naval Aviation Cadet Selection Board for immediate enlistment.

If you are in doubt as to where you can obtain training, or if you need further information, the C. A. A.'s list of approved training schools will help you make arrangements according to the district in which you live. There are excellent commercial schools throughout the country, where you can learn airplane mechanics, welding, metal work, parachute manipulation, carburetor and propeller maintenance, armoring, and aerial photography. All good schools are registered and provide courses approved by the C. A. A.

The Army Air Corps' training program runs parallel to that of the Navy. The Army urgently



MOST PROGRESSIVE of all high schools teaching preflight aviation is the Bronx School of Science. Above, students study wing lift and drag.

needs aviation cadets. You can apply at your nearest recruiting office, which will direct you to the aviation cadet examining board. Training is given in special schools in the following courses: bombardment, navigation, flying, armament, communication, meteorology and photography.

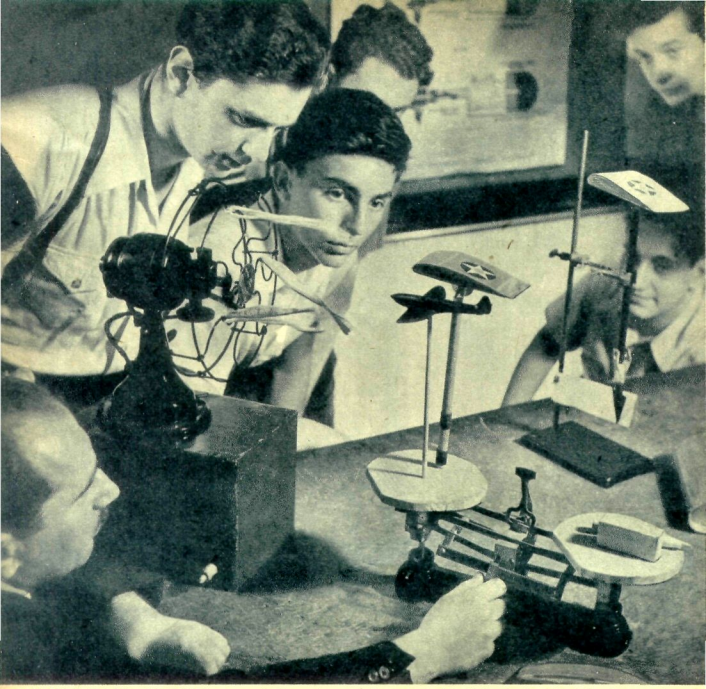
Many readers may want to obtain positions in the aircraft industry. In addition to the intensive vocational training courses available through public schools, information about which can be procured from the state director of defense training, the Federal Committee of Apprenticeship has a department which assists employers to plan programs for training skilled workers. You can obtain details from the nearest office of the U. S. Employment Service, or from the State Director of Apprenticeship. There are courses available in aeronautical engineering, science, airport management, production supervision, physics and chemistry.

The Civil Service Commission is charged with recruiting civil-

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DR. ALEXANDER JOSEPH, well-known author, lecturer and aviation instructor, explains the fine points of airplane recognition to students.



EFFECTS OF AIR CURRENTS on an airplane wing are demonstrated to high school students by the use of an electric fan, a model plane, a model wing section and various home made devices for measuring wing lift.

ian personnel, and from the Commission's central office in Washington you can get information of existing vacancies in aviation which require professional, semi-professional, skilled and semi-skilled workers. These positions are not available to those who have not been trained for them. In the general list, we find aeronautical engineers, draftsmen, inspectors, mechanics, machinists, instrument mechanics, ordnance mechanics, bombsight mechanics, propeller mechanics, metalsmiths, maintenance supervisors, sheet metal workers, welders, painters, and riggers.

You can study for these positions, provided you have the necessary qualifications, while at public school or by taking courses at night school. In considering these occupations, remember that aviation will not stop after the war but will continue to develop. Above all, do not worry the employment departments of local aircraft factories unless you are fully equipped with credentials to show that you have completed the necessary courses in the work you choose to do.

The aviation industry is open to girls as well as boys today. Many students at the aviation vocational schools are girls, and the U. S. Department of Labor states that women can undertake the following work effectively: machine shop, press and forming departments, metal fabrication, bench and stainless steel assemblies, fuselage and wing assemblies, control surfaces, final assembly, painting, and covering.

The college defense training program is sponsored by the U. S. Office of Education and open to girls. The U. S. Weather Bureau also accepts girls applying for training in advanced meteorology.

Many of you will want to assist in the nation's war effort while learning. Those who are not intending to make aviation a career can do valuable work as well. The newest branch of the Civil Air Patrol is the C. A. P. cadets, which is sponsored by

the Office of Civilian Defense. Possible services in the C. A. P. are as follows:

Pilots: male or female, 18 years minimum age; citizens; private pilot's or higher license.

Aviation mechanics: male or female, 16 years minimum age; citizens; license.

Radio Telephone Operator: male or female, 16 years minimum age, citizens; license. If a pilot, a third-class license is sufficient; if not a pilot, must have better than third-class license or be generally trained in radio work.

Director Landis, of the O. C. D. recently stated that membership in the C. A. P. cadets would be available to American-born students in their last two years of high school. The young volunteers will be given opportunity to work directly under the senior members of C. A. P. and will be given thorough schooling in the fundamentals of aviation. This new branch of the C. A. P. resembles in many ways the Air Training Corps of England, because it provides the members with a chance to work directly with airplanes, under the direction of skilled workers and instructors. Each senior member of the C. A. P. is allowed to sponsor a junior.

Even if you are under the age for membership in this organization, you can find several others that will help you become air-conditioned. One is the Jr. Air Reserve of the Air Youth Division of the National Aeronautic Association in Washington. This group is patterned on the Civil Air Patrol and is open to young people from twelve to eighteen. When you have completed their courses of instruction, you should be qualified to apply for training as an aviation cadet in the Army Air Corps, or as an enlisted man with a decided advantage over the next fellow.

Any boy or girl between twelve a l eighteen can be enrolled with the consent of his parent or guardian. If you are under twelve, you can put your name on the waiting list. The Jr. Air Reserve works on flights which are supplemented with lectures and instructions from headquarters in Washington. Training bulletins are issued and instruction given in model airplane building, recognition of planes, and all the phases of pre-flight aeronautics.

Both the Boy Scouts and the Girl Scouts of America and the Camp Fire Girls have aviation sections. You can apply at local chapters for details of their work. They provide lists of books and sources of information for study in your spare time, and will be glad to generally direct your interest in aviation to whatever field you think you are most suited for.

Your air education is all around you. Whether you are young or old, you have only to go and take it; you can learn and work; you can work and learn. Everything you do about aviation now will be worthwhile. Your government is ready to help you; your schoolmaster is ready. Now help yourself, and if you do not find just what you want at first, go look for it, and don't give up until you find it.

This is the air age. When the war is over there will be opportunities of all kinds for those who have prepared themselves.

Remember, we have only just begun to fly.



BASIC RULES OF FLYING are explained to a Bronx high school student with the help of a simple control rig. Rudder pedals and stick are linked to ailerons and tail assembly which actually function in response to the movements of the controls. Of all high school subjects, aviation is usually voted the most popular.

NEW PIPER PRIMARY TRAINER



THE Piper Aircraft Corporation has announced the development of a new all-purpose primary trainer, particularly for use in War Training Service and other pre-military aviation programs.

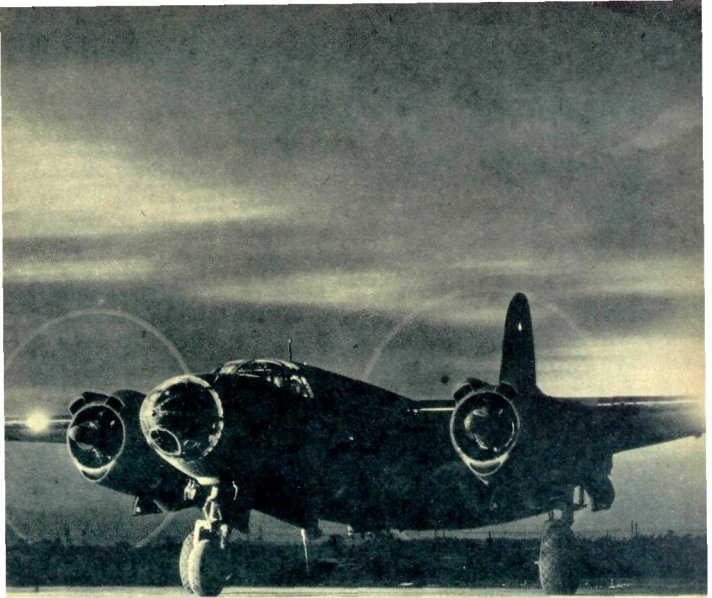
The new ship is relatively low in power yet high in performance, has a Franklin 130 H.P. six-cylinder, horizontally opposed engine which will carry it through aerobatics smoothly and without stalling out.

Utilizing the modified version of the airfoil section of previous Piper Trainers, the ship has excellent stall and spin characteristics. It has retained the high-lift characteristics of its predecessor, Piper J-3, at the same time delivering a much higher speed. In addition to flaps, the ship has a retractable landing gear. The gear is self-locking and has visual indicators, in each cockpit, as well as an oral warning device. Among the safety features of the new trainer are its high degree of visibility, wide tread of the oleo spring-type gear and military-type hydraulic brakes.

Front and rear cockpits are identically outfitted, all instruments and controls are dual and located in the same positions. They include flap control, parking brake, gear retracting mechanism control, wobble-pump, starter, carburetor heat, cabin heat, fuel selector valve, airspeed indicator, bank and turn indicator, rate of climb indicator, altimeter, clock, compass, tachometer, oil thermometer, fuel pressure and oil pressure gage. Fuel gages are on each wing directly above wing tanks, easily visible from either cockpit. Navigation lights are installed as standard equipment, and for night flying, provision is made for the installation of landing lights and flares. For instrument training, an auxiliary panel is installed above the standard rear panel, attaching to the nose over structure. This panel includes the remaining blind-flight instruments necessary, as well as radio equipment which can be operated from either cockpit. An added feature which should be of especial interest to the operator is the inclusion of an odometer on the front tachometer. Based on the average r.p.m. through all operations, this instrument clocks the operating time, and will prove an invaluable aid in accounting for periodic inspections as well as in checking oil and fuel consumption, etc.







. . . "For now began night with her sullen wings to double-shade the desert." . . . *Milton—"Paradise Regained"*

MARTIN MARAUDER

Landing lights gleaming in the falling dusk, propellers still whirling from the last gasps of powerful motors, a twin-engined Marauder comes to rest before its hangar at The Glenn L. Martin Company, Baltimore, after passing its Army acceptance flight.

This powerful ship is harassing the enemy on whatever front encountered; has been used with equal success in the cold of Alaska; the heat of Africa and the humidity of the South Seas. Able to take care of itself on bombing missions, due to its tremendous speed, fire power and armament, the Marauder emerged from the Battle of Midway in a new role—that of a torpedo plane. More recently it played an important part in the rout of Rommel.

AAFSAT

CONTINUED FROM PAGE 17

The Bombardment Command of AAFSAT, as of every Air Force, is one of the most important components. The duty of bombardment is to soften the enemy, and all types of bombing planes are used, depending upon objects to be bombed and other factors such as whether it is to be a low, medium or high altitude attack.

Thus it becomes essential to have men trained in all types of bombing. This means study of the use of attack bombers, such as the popular A-20 which was among the first American planes to strike at Europe when Holland airdromes were bombed successfully last July 4. It also means the utilizing of dive bombers, medium bombers such as the Mitchell B-25, and the heavier bombers such as the B-17 Flying Fortress and the B-24.

Like other phases of AAFSAT training, bombardment operates under simulated combat conditions. Problems are worked out with comparable distances such as from Tobruk to Turin, from Darwin to Timor.

The bombers often go on 1,500-mile missions into the Gulf of Mexico where they will bomb an aluminum slick. On their way there and back dozens of P-47 Thunderbolts, P-40's and other fighter craft will attempt to intercept them. Returning bomber pilots often say actual combat conditions are, if anything, a little easier and more simple than the simulated conditions they find at AAFSAT.

Navigation, dead reckoning and meteorology are ingrained upon the students, as well as the use of many secret devices. Students often practice in synthetic trainers before going out on simulated missions, to put into practice what they've learned.

A Flying Fortress with a crew which is completely coordinated and working together like a team, is one of the most potent weapons in the war. But even then it's not nearly so potent as 20 or 30 Flying Forts all working together.

There's strength in numbers, and losses are far less. Great fleets of bombers require perfect coordination, cooperation and teamwork. Training then cannot be given alone to individual bombers, but it must be given to whole flights, and then to even larger components.

Bombers look pretty flying in perfect formation. It's a real sight. But to accomplish such formation flying and teamwork, pilots must almost work their hearts out, their backs will burn and their necks get stiff with tension in order to bring teamwork to formation flying. Oddly enough, the better a team works together, the higher its morale, the more pride it has in what it is doing, and the success it achieves grows greater and greater with the comparable increase in coordination and cooperation.

Air Defense, also a command at AAFSAT, has the primary function in combat theaters to deny the enemy freedom of the air. It does this chiefly with fighter planes which are as fast as any in the world and have fire power that is tremendous.

Air Defense is not all up to the fighter planes. A great deal of it is in the proper use of detecting devices to locate the enemy. Fighter planes cannot, because of gasoline limitations, be kept flying around the sky at 400 miles per hour or more, waiting for the enemy to arrive. It therefore becomes necessary to have an organization of detectors which can give sufficient warning to the fighters to enable them to take off and reach a higher altitude than their enemy when they are brought together in battle.

Requiring the use of elaborate devices, as well as the training of controllers and filter room operators and radio technicians, Air Defense becomes one of the most important components of the complete Air Force.

At the same time, Air Defense protects the other components of the air force, in comparison to Air Support whose first study is to eliminate the enemy air force and finally support ground forces. Air Defense devises ways and means to let everyone know when the enemy is coming, where he is coming from, how soon he will arrive and, if possible, in what strength.

Primarily Air Defense intercepts the enemy long before he can reach his objective and cause any damage, just as it is the Navy's objective to keep enemy ships from the United States.

Tactical development at AAFSAT is really the plan by which the complete air force operates. Consequently it is of tremendous significance and importance. The plan must be perfect, else equipment and men are of no avail.

Tactical development is merely the manifestations of technical developments and their application to war tactics. For instance, an inventor sitting in an attic makes a new discovery resulting in the manufacture of a new type of instrument. He comes to the tactical department with it.

It is not immediately accepted. It must be tested and men and equipment must find it adapted for war tactics, else it is of little value.

Tactical development can be divided into three phases. First, materiel and equipment; second, organization, or a setup of men and officers who are geared to a new development; and third, tactics, or a plan.

If all three phases are integrated, coordinated and made workable, they constitute a tactical development.

The Air Corps no longer starts from the bottom and works to the top in organizations. Rather, the policy is to start from the top and work down. After all, commanders in the various theaters of battle know more exactly what is needed. Their wishes become known to the tactical department at AAFSAT, and then the organization, materiel, equipment and plan are coordinated.

Another function of tactical development is to reconcile all battle tactics. Like a washing machine, the Tactical Department wrings out every bit of information received daily from the battle fronts. It then evolves principles which can be reissued to other or all theaters of combat. Tactical development is merely the rationalizing of what has been learned in combat.

The Tactical Department at AAFSAT now has more than 400 projects on hand. They are of varying importance, ranging from fighter technique to aircraft construction, armament and fire power, interception, anti-aircraft procedure and even the use of searchlights.

The School of Applied Tactics thus is, in reality, exactly what its name implies, a school for training key personnel to apply the latest battle tactics and other developments to their combat work. In this manner, units and groups going overseas are already trained in fighting when they reach the combat areas, instead of having to do it the hard way with the attendant cost and casualties.

11,748 MILES TO INDIA

An Army heavy bomber was flown 11,748 miles from the United States to an advance base in India by an Army Air Forces crew in 67 hours and 35 minutes.

TACTICS TOUR

(CONTINUED FROM PAGE 18)

tion and other methods.

Then I was taken to the air field where the problem was demonstrated with fighter planes right in front of my eyes. Enemy fighters roared over the field in criss-cross pattern, strafing objectives which their intelligence had determined were the proper targets.

Fast P-40's came from down out of the blue to engage them. For 30 minutes there ensued a terrific dogfight in the skies over the airport by dozens of planes until the enemy was driven off.

The next day I took off in a formation of nine Flying Fortresses, B-24's and Mitchell Bombers. Our Fort was named Big Bessie. Our objective was a bombing mission on a specied bombing range about 80 miles away. We carried 100-pound bombs, just heavy enough to make craters that could be seen.

On the way we were to rendezvous at the edge of the Gulf of Mexico with the Mitchell Bombers, and then to proceed on the mission. Everything was timed to minutes and seconds. But on the way to the rendezvous we were viciously attacked by P-47 Thunderbolts, and other faster planes. The crews of the Fortresses laughed.

"Brother the formation we're flying in, nothing can knock us down," a young crew member a few months out of high school declared.

The formation looked easy, but the co-pilot told me that flying a Fort is a tough job, especially to keep such perfect formation.

We got to the bombing range and bomb bays were opened. Then it was "bombs away" and the crew shouted a cheer. Forty-five bombs were dropped into a 1,000-foot diameter circle from 6,000 feet.

Later we returned to score the bombing. Forty of the bombs had made craters inside the circle, the other five were on the edge. It was even better than I imagined.

The civilian observor, no matter how much he knows about aviation, is immediately aware of the note of realism about this school. The young men may sit in classrooms and hear lectures and work on dry mathematical problems. But there's an enormous amount of actual field training under simulated combat conditions, dropping live bombs and firing real ammunition.

Never before in history has a school like this one existed, and the results it is obtaining are nothing short of amazing. These results will soon start appearing as banner lines in your home town newspapers, if not already printed.

I couldn't help but be dumfounded at the power, speed and altitude of our newest planes. Some of them I had never heard of before. Others can be described.

There is the P-38 Lightning, a plane which the Germans will not meet unless they have a definite two-to-one superiority. Even then they're cautious. It has four 50 calibre machine guns and one 20 millimeter cannon. The fire power is terrific. It flies at high altitude, is exceptionally fast and can knock almost any plane out of the air.

Then there's the new P-47 Thunderbolt, one of the heaviest planes of its size in the world, weighing slightly more than seven tons. Its name describes it realistically, and when a Thunderbolt gets on a Messerschmidt or other German plane's tail, it's like a snowball disappearing in a frying pan.

There's the old standby of course, the P-40; the new A-20 Attack Bomber; the Night Fighter, something entirely new, about which you'll be hearing more in the news. AAFSAT has more than 30 types of aircraft which it utilizes every day in its complete Air Force, sprawled at subsidiary airdromes and camouflaged areas in Central Florida.

One of the interesting facts gleaned from the tour is that it probably has more young officers from the actual combat zones than any similar area in the United States. I talked with scores of these veterans who had just come from India, Burma, China, the Aleutians, Tunisia, Guadalcanal, Australia, and other theaters of combat operations.

The last day of the tour I was shown all of the different types of arms now being used by the air corps. Some of them are still highly confidential and secret.

But there are others whose fire power is terrific, better than anything the Nazis or Japs have used yet in the current war.

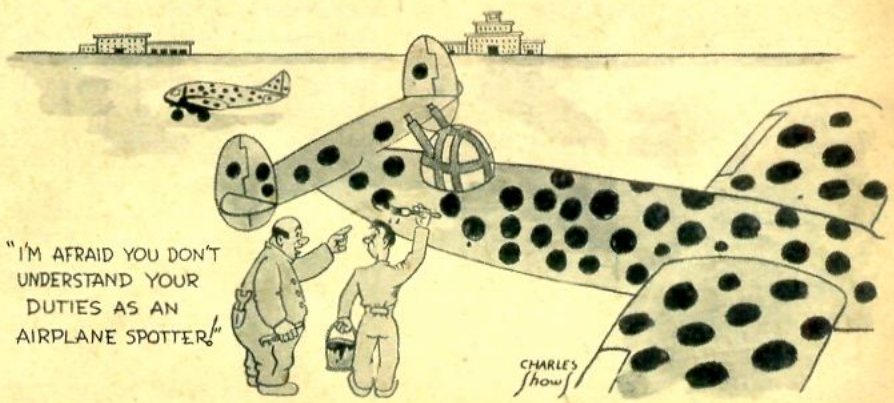
For example, there's the Bazooka, an anti-tank gun that can pierce four inches of the heaviest armor plate. It is a rocket type gun. Two men wearing gas masks and protective clothing operate it. The masks and protective clothing are used to prevent severe burns and gassing, for when the Bazooka is fired, a stream of flame and gases shoots as much as 20 feet out of the rear of the gun.

There are all types of small arms; carbines, tommy guns, submachine guns, rifles, shotguns, and cannons from 20 millimeters upwards in size. Then too, there are fragmentation grenades and bombs, and even the huge block buster that actually demolishes a city block.

I not only saw all of this armament, but actually helped to fire much of it just to see how tremendous and concentrated is their fire power. I know now, and I pity the poor Japs and Nazis.

At the end of five days I came away from AAFSAT more impressed than by anything I have ever seen before in my life, and I've been to many Naval and Army bases, posts and camps. I came away with a good feeling, of knowing deep in my mind that soon victory will be achieved, that the enemy will be crushed and annihilated, and that civil aviation can then resume its job.

No, sir, nothing can stop the Army Air Corps!



In the Air

ARMY WEATHER CADET PROGRAM TO TRAIN 10,000 METEOROLOGISTS

A new cadet training program is being started, which by mid-1945, should graduate more than 10,000 meteorologists to staff the Army Air Forces' world-wide forecasting system. The new program, together with the Air Forces' present meteorological courses, will make use of existing facilities on campuses throughout the nation.

The existing program, which graduates students for commissions after nine months, is known as the "A" phase of the over-all program. The "B" phase of the program has been launched with several thousand cadets selected from volunteer inductees who were college sophomores or freshmen particularly well qualified in mathematics and physics; these cadets take a shortened basic course, being fed into the professional meteorology classes next September. In the "C" phase of the program several thousand volunteer inductees with high school or college freshman education have entered classes on twelve campuses. Despite the fact that these students face the longest and one of the hardest training courses in the Army's wartime educational program, applications have totaled four times the enrollment. The basic studies for this group will continue one year, with a week's furlough each three months. Mathematics and physics are stressed. If they graduate after twelve months, they move on into the professional meteorological colleges for an additional eight months' schooling, being commissioned upon graduation.

WHIRLWIND FIGHTER PLANES NOW CARRYING BOMBS

Whirlwinds, among the most effective aircraft in Britain's Fighter Command, have begun to carry bombs and have been used to good advantage in recent daylight raids. The bomb-carrying Whirlwinds are not so much fighter-bombers as fighters adapted to bombing uses. Although a bomb-load slightly reduces their speed and rate of climb and somewhat affects maneuverability, their fighting qualities automatically return when the explosive cargo is released.

MAJOR BARRINGER, MISSING FLYER, RECEIVED D. S. M. AND GLIDER TROPHY

The Distinguished Service Medal and the Edward J. Evans Glider Trophy for the "greatest individual contribution to glider development during the year 1942" have been awarded to Major Lewin B. Barringer, who was in an airplane lost at sea. Major Barringer was the author of the article "Gliders By The Thousands" which appeared in the March issue of FLYING CADET.

WARNING UNITS GUARD INDIA FROM AERIAL ATTACK

Aircraft warning-net teams of the United States Army Air Forces, who live high in the mountain fastnesses amid head-hunters, are making India virtually surprise-proof against Japanese aerial attack. These hardy outfits, composed of radio operators, observers, radio repairmen and a medical attendant and cook, are in such remote places that it takes from two to three weeks to reach them by trail. Supplies are dropped regularly from the air. The Americans are getting along on friendly terms with the head-hunters.

ARMY FIGHTERS FLY TO COMBAT THEATERS

Joining the aerial procession of the bombers and cargo airplanes across the high seas to combat theaters around the world, Lockheed Lightning P-38 fighters now are going to war under their own power, releasing shipping space required for other cargo. Long range ocean flights are made possible by the use of stream-lined laminar flow releaseable tanks hung from special fittings under the wings, and long range oxygen equipment. On the northern crossing, Arctic packs and rubber boats are carried. On the overland stretches via the southern route, "jungle kits" are provided, replacing the rubber boat and sea equipment. Concentrated rations are provided on all flights, over sea or land. Mechanics and factory experts have accompanied the fighter flights in Army transport airplanes, assisting in their servicing and maintenance. Flying Fortresses also have joined forces with the fighters to take care of the navigation problems.

"POINT SNORKERS" ORGANIZED BY U. S. AIRMEN

"Point Snorkers," an informal society open only to those "who are men enough to grow a rated thatch on the upper physiognomy" has been formed among members of the U. S. Army Air Forces in North Africa. Its membership card is an Algerian 5 franc note, which is to be furnished by the candidate himself. Printed in ink across the top of the note is "Point Snorkers" and along the left side are the member's name and the words "North Africa." Each member signs a fellow member's card without charge.

Once elected, the membership card must be carried on the person at all times. He who fails to produce it when asked to do so by a fellow "Snorker" must fork over five francs to all members in the immediate vicinity. Once inducted, a member cannot remove the distinctive feature on his upper lip unless by order of higher command or upon return to the United States. Furthermore, it must be clearly visible from a distance of 100 feet. The successful use of wax on the extremities so that its application can be readily recognized is a determining factor to justify membership.

U. S. PILOTS CHAT IN DOUBLE TALK

Four United States Army Air Forces fighter pilots chatted back and forth by radio in double talk as they shot down four bombers and severely damaged two others out of a flight of 37 Japanese planes in the South Pacific. The pilots had nicknamed each other after characters in Damon Runyon's stories of Broadway ("Big Mig," "Harry the Horse," "Guinea Mike," "Handaxe John," etc.) and they used these names in ordinary conversation on the ground so they would be easily recognized over the radio high in the sky during a dog fight. These four P-39 Airacobras were on patrol over the Russell Islands northwest of Henderson Field, Guadalcanal Island, when they sighted the Japanese planes. They waited high in the clouds until the bombers got out far enough in front of their fighter protection and then roared down and took their toll. As one American chased a Jap bomber around the island, this was the conversation he directed toward his comrade: "Spanish John calling Little Isadore. Spanish John to Little Isadore. Have chased this character around the island until I am tired. It would be greatly appreciated by Spanish John if you went around the other side of the island to get this joker in the middle."

FLYING CADET BY-LINES

BRIG. GEN. HUME PEABODY, commandant of AAFSAT, was a member of the famous class of '15 of West Point, which produced such generals as Eisenhower, Stratmeyer, McNary and Hanley.

He skipped his senior year at Cheyenne, Wyoming, high school to enter West Point, at the age of 17. He first started flying at Rockwell Field, San Diego, Calif., in 1917.

In 1918 he went to France to make a survey of aviation equipment needs at the front. Later he became successively commanding officer of the 19th Pursuit Squadron, 5th Composite Group, March and Luke Fields, and then served five years as assistant professor of Military Science and Tactics at University of California.

He has attended the Air Corps Tactical School, Command and General Staff School and Army War College. Prior to his assignment as commandant of AAFSAT, he held the post of director of war organization and movement of the Army Air Corps at Washington, D. C.



Slight in stature, he is endowed with a pleasant personality and thoughtful demeanor. Rated an excellent flier, he's extremely modest of his achievements.

His only son who was a pilot in the European theater of combat was reported killed in action recently.

SUB-ZERO HURRICANES TEST NEW STRATO PLANES

Man-made gales 67 degrees below zero, hurtled through space at 600 miles an hour, will test the endurance of Uncle Sam's stratosphere bombers and fighters before they leave the ground in the Army's newest and most powerful wind tunnel. Icy blasts manufactured by a 40,000 H. P. motor will race through the tunnel striking engines, nacels, landing gear and working models with terrific force, thus testing the performance of plane parts and scale models under the same low temperature and air pressure encountered in aerial battles eight miles above the earth.

ARMY PRE-AVIATION

Men between the ages of 18 and 26 who are enlisted in the Air Corps Enlisted Reserve for pilot training under the Civil Aeronautics Administration's War Training Service will receive an opportunity to qualify for Army Air Forces pre-aviation cadet (air crew) training. Applicants for re-examination under this program must secure and present to an Aviation Cadet Examining Board a certificate from the C. A. A. War Training Service showing that they are not employed as instructors, do not hold key positions, and are not currently assigned to a C. A. A. War Training Service course of pilot training.

Upon passing the prescribed Army Air Forces mental and physical examinations for flight training, successful applicants will receive the same course of training as all 18-26 year old candidates for aviation cadet (air crew) training.

CIVIL AIR PATROL

No changes are contemplated in the administrative and operating methods of the Civil Air Patrol which was recently transferred from the jurisdiction of the Office of Civilian Defense to the War Department. It will continue as a volunteer civil organization, operating as an auxiliary of the Army Air Forces. The use of Civil Air Patrol planes is expected to continue so long as the supply of replacement parts does not divert critical materials from more immediate needs. No reduction in the extent of the anti-submarine patrol is contemplated, nor will the Southern Frontier Liaison Patrol or the various courier services be changed. Certain non-military activities such as forest fire patrols, levee patrols during flood season and courier service for war plants, will also be continued.

BACK NUMBERS

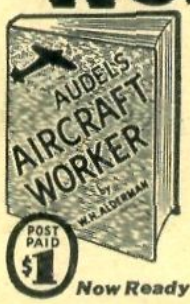
Any previous issue of Flying Cadet may be obtained from the publishers, postpaid, at twenty-five cents ($.25) per copy. When ordering back numbers, please refer to the following complete list:

Vol. 1. No. 1. January, 1943
Vol. 1. No. 2. March, 1943
Vol. 1. No. 3. April, 1943
Vol. 1. No. 4. June, 1943

Due to limitations on the use of paper, imposed by the War Production Board, there have been no issues of Flying Cadet this year dated February, May or July. The magazine will be published monthly, without interruption, in the future.

Subscriptions are accepted to start only with the first number following the issue that is current at the time the subscription is received. (All earlier numbers must be ordered individually from the price list above.) Four weeks should be allowed from the time the subscription is mailed until the first magazine should be expected. Mail subscriptions and orders for back numbers to Flying Cadet, 420 Lexington Avenue, New York, N. Y.

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William L. White

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W. L. White has interviewed Lt. Col. Frank Kurtz and his Fortress crew—all survivors of the famous 19th and 7th Bombardment Groups — and from their personal accounts, he has built up this moving story of the first great air campaign of the present war.

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Harcourt Brace & Company, 383 Madison Avenue, New York. $2.50.

WINGED MARS (Volume I)—
John R. Cuneo

The German Air Weapon 1870-1914 is the first part of a highly significant book on air power. WINGED MARS is an accurate history of the development of air power and the changing role it has played in the strategy of wars. This first volume provides a solid foundation upon which the reader can establish a thorough understanding of air power and its part in the present war. $2.50. Military Service Publishing Company, Harrisburg, Pa.

FUNDAMENTALS OF RADIO—
Edited by William L. Everitt

FUNDAMENTALS OF RADIO presents the basic material of radio required for all civil and miltary radio work. Each of the contributing authors is a recognized authority and has had extensive experience in the radio field. The book opens with a concise review of all the mathematics the reader must know to understand the succeeding chapters, and then covers the entire field of basic communications from the simplest A. C. and D. C. circuits, through vacuum tube theory and application and wire telephony and audio systems, including FM transmission. $5.00. Prentice-Hall, Inc., 70 Fifth Avenue, New York.

THE ABC OF AVIATION—
Lieut. Col. Victor W. Page, U. S. Air Corps Reserve

A simplified guide to modern aircraft—How they Fly and Why—$2.50. The Norman W. Henley Publishing Co., 17 W. 45th Street, New York.

HOW A PLANE FLIES—
Charles Gilbert Hall

The style of this book is charming because of its very simplicity. HOW A PLANE FLIES explains exactly and clearly, so that all may understand what makes a plane fly. It tells also what a pilot must know, how the radio beam is used, how the instruments work, and how various weather hazards have been overcome. It is a delightful and informative volume. $2.00. Funk & Wagnalls Company, 354 Fourth Avenue, New York.

BASIC MATHEMATICS FOR PILOTS AND FLIGHT CREWS—
C. V. Newsom and H. D. Larsen

This book is a good practical survey of the mathematics a preflight cadet will need and of the mathematical problems he will meet in actual flight. It follows the outlines of the Civilian Pilot Training Program sponsored by the Civil Aeronautics Administration. It starts with a quick review of the arithmetic, algebra and geometry required in flight training and covers graphical analysis in aeronautics, study of scales, use of the vector in force and velocity diagrams, use of the circular slide rule in navigation, and use of the Dalton computer. Prentice-Hall, Inc., 70 Fifth Avenue, New York. $2.00.

BASIC PHYSICS FOR PILOTS AND FLIGHT CREWS—
E. J. Knapp

Like the similar volume on Basic Mathematics, this book follows the outline suggested by the Civil Aeronautics Administration, surveying the fundamentals of physics for pre-flight cadets. Each topic is clearly defined and practically illustrated and the problems given are concerned with piloting and navigation, etc.—problems which every student airman must learn to solve. $1.65 Prentice-Hall, Inc., 70 Fifth Avenue, New York.

FLYING HEALTH—
M. Martyn Kafka, M. D.

This practical, simple handbook by a former U. S. Army Air Corps flight surgeon, outlines everything the pilot should know in order to keep himself at the peak of physical and mental fitness. $2.00. Military Service Publishing Company, Harrisburg, Pa.

A Start in METEOROLOGY



By Armand N. Spitz

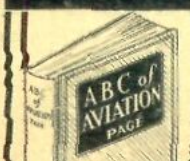
A simple introduction. Provides a surprisingly clear understanding of what the weather is and why. Enables the beginner to learn quickly through making predictions of his own. 1943 Second Edition Revised. 110 (5x8) pages. Illus. $1.50

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RECOMMENDED READING

YOUR WINGS—*Assen Jordanoff*

YOUR WINGS is a thorough course in flying, simply and graphically explained and profusely illustrated, covering everything from ground training to instrument flying, and interpreting clearly all methods of operation in flight and the purpose of every item of aircraft equipment. This excellent book is achieving world-wide circulation. Funk & Wagnalls Company, 354 Fourth Avenue, New York. $3.00

THROUGH THE OVERCAST—*Assen Jordanoff*

THROUGH THE OVERCAST is written in simple language and illustrated by many effective pictures and diagrams. It gives vital information on the laws of weather and on the working of all precision instruments by which weather hazards have been conquered. $3.00. Funk & Wagnalls Company, 354 Fourth Avenue, New York.

SAFETY IN FLIGHT—*Assen Jordanoff*

SAFETY IN FLIGHT sets forth all the knowledge necessary for safe flying, including the practical application of weather knowledge and explanations of many safety-promoting devices. The text is enriched by a great many photo-diagrams. $3.00. Funk & Wagnalls Company, 354 Fourth Avenue, New York.

VISIBILITY UNLIMITED—*Lieutenant Ernest G. Vetter, U. S. Navy*

This book is especially intended for students in pre-flight aviation courses. It helps the reader to obtain a clear preliminary understanding of air navigation and meteorology. $4.00. William Morrow & Company, Inc., 386 Fourth Avenue, New York.

A START IN METEOROLOGY—*Armand N. Spitz*

This book is an introduction to the science of weather, written primarily for young people who are interested in aviation and in meteorology from the viewpoint of aviation. $1.50. The Norman W. Henley Publishing Co., 17 West 45th Street, New York.

AIR NAVIGATION FOR BEGINNERS—*Scott G. Lamb*

Written for young aviation students, this book is a systematic, concise introduction to Air Navigation. It establishes a firm foundation for more advanced study of the subject. The Norman W. Henley Publishing Co., 17 West 45th Street, New York.

FIELD OF ACTION OF AIRCRAFT—*W. W. Smith*

Here is a concise booklet which shows a simple, new method of solving all radius of action problems. Students, as well as pilots and navigators, will find it most valuable. $1.50 Jardur Import Co., 874 Broadway, New York.

HOW TO FLY AN AIRPLANE—*Captain Bernard Brookes*

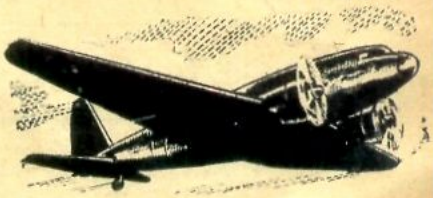
Captain Brookes, pioneer in the field of aviation, has compiled, lesson by lesson, a course in basic flight instruction which purports to give a basic understanding of flying to those who will ultimately enroll for a student flying course; to give the "right start" to those who are interested in flying. The lessons have been written in informal, conversational style, as conversations between the training instructor and the student. It should be easy to learn from this book. Garden City Publishing Co., Garden City, N. Y.

CHANGE OF ADDRESS

If you are moving from one address to another, please notify us as promptly as possible in order to avoid delays or any copies of the magazine going astray. Notice of a change of address should be received by the publishers at least 30 days in advance. Always be sure to include in your notice both your old address and your new address. Flying Cadet, 420 Lexington Avenue, New York, N. Y.

AVIATION BOOK LIST

The division of aeronautics of the Library of Congress, Washington, D.C., will furnish upon request a mimeographed list of elementary aeronautical books covering such fields as navigation, instruments, engines, and vocational guidance. This list of books will be found particularly valuable to high school teachers and instructors of aviation subjects.



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CADET QUIZ

Answers to Questions on Page 38

A. When it is an easy job. Any task considered simple to execute is called a "piece of cake" by the bomber crews.

B. 1921, on the Glenn L. Martin MB-2 bomber.

C. The all-clear air raid signal.

1. The part of radio beams in which signals fade out.

2. The aviator who was pulling advertising banners behind his open cockpit plane went into a steep dive followed by a zoom.

3. False: an air scoop is used to catch air for engine combustion or for ventilation of a plane. Because it juts into the air stream, it retards rather than aids streamlining.

4. All, like airplanes, are heavier-than-air aircraft.

5. Browned-off.

6. A flip.

7. Airembolism.

8. *Defiant, Lysander, Spitfire, Miles Magister.*

9. Brig. Gen. Claire Chennault.

10. Structural member of a fuselage.

11. Ground targets. "Rhubarb" is a strafing operation.

12. False: Marconi invented radio in 1902; the Wrights made their first successful flight in 1903.

13. Earthquake waves. Minor earthquake waves are set up by a bomb when it strikes the ground. These waves are measured by sound recorders set up in pill boxes around the targets.

14. It weaves in its track as the automatic pilot maintains it on its course.

15. St. Francis (of Assisi).

16. No. He is a pilot who is over-dependent upon his instruments and keeps his eyes in the cockpit rather than on what is happening in the air outside him. He's a poor fellow to have as your wingman in a flight formation.

17. The canopy of an airplane is the transparent sliding portion of the cockpit cowling. The canopy of a parachute is the part which billows out and supports it in the air.

NOTICE TO SUBSCRIBERS

In order to conserve wood pulp, which is important in the production of munitions, the War Production Board has imposed an order restricting the use of paper. All magazine publishers have been limited to the use of specific, curtailed quantities of paper. In the case of Flying Cadet the curtailment is particularly severe because Flying Cadet is a new magazine. With regret the publishers of Flying Cadet, therefore, announce the elimination of two issues of this magazine. The May and June issues were combined as one magazine called the June issue. The July and August issues are combined as one issue called the August issue. This does not affect the number of magazines to which subscribers are entitled. All subscriptions automatically are extended for two months. A one-year subscriber will receive twelve issues of Flying Cadet, even though they extend over a period of fourteen months.

Sufficient paper has been given the publishers so that after the August issue, the magazine will be able to return to its normal, monthly frequency of issue.

ARMY AIR FORCES PILOT JOINS ENEMY FLIGHT

Lieutenant Colonel Frank L. Dunn, Air Corps, of San Antonio, Texas, evaded detection while on a photographic mission by joining a flight of enemy planes which were circling to land near Cagliari, Sardinia. Dunn's primary mission was to locate an Italian cruiser in the Harbor. Since unfavorable weather conditions made high altitude photography impossible, Colonel Dunn flew his plane at 100 ft. or less, actually passing over the seaplane base and city of Cagliari, and obtained invaluable photographic information of the shipping in the harbor. Before anti-aircraft gunners and enemy pilots noticed that an American plane had joined the Axis group, Colonel Dunn had completed his mission.

RIGHT OR WRONG

Answers to questions that appear on Pages 36 and 37

There are two German, three British and three United States airplanes in the drawings on Pages 36 and 37.

1. Blackburn Skua, a two-place dive-bomber used on carriers. British.
2. Focke-Wulf FW-190, a German single-place fighter with a two-row radial engine. German.
3. Grumman F4F Wildcat, used in the South Pacific as a shipboard fighter and also as a land-based plane. United States.
4. Hawker Hurricane II, a single-place, medium altitude fighter equipped with Rolls-Royce-Merlin engine. British.
5. Focke-Wulf FW-189, twin-boom, twin-engine reconnaissance fighter. German.
6. Lockheed P-38 Lightning, an extremely versatile airplane, especially used as a fighter but also as a low-level attack and dive-bomber and for photographic reconnaissance. United States.
7. Fairey Fulmar carrier-based, two-place combination fighter and bomber, equipped with a Rolls-Royce Merlin X engine developing 1145 h.p. British.
8. Curtiss P-40 F Warhawk. Latest of the Curtiss hawk series and the first to be powered by the Rolls-Royce V-type 1200 h.p. engine built by Packard. United States.

U. S. ARMY PLANE DELIVERS MEDICINE TO WARSHIP

Medicine needed in an emergency was delivered recently to a warship of a friendly nation several hundred miles at sea. The medicine was flown in an Army Air Forces transport plane from a base hospital to an airfield in Central America within approximately two hours after the radioed call for help had been received. Then, wrapped in many layers of soft cotton, it was attached to an inflated rubber life raft and was secured by ropes in the bomb bay of a B-24 Liberator bomber. After several hours' flight, the Liberator sighted the warship, convoyed by several destroyers, and after an exchange of recognition signals it circled the leading destroyer until it was only 50 ft. above the waves. Crew members then cut the ropes holding the life raft and dropped a smoke flare to mark the location on the sea. The Liberator circled the position for ten minutes while the destroyer maneuvered alongside the floating raft and hoisted it aboard with grappling hooks. The destroyer's crew stood at attention in tribute to the crew as it started back to its base.


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